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NEWSPAPER

COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

Weekly Newspaper Second-class postage paid at Framingham, Mass., and additional mailing offices ©1980 by CW Communications, Inc.

No. 6 February 11, 1980 $1.00 a copy; $30/year

Wide World Photos

On Its Way

An exuberant crowd greets Edward Jepson in Princeton, N.J., as he carries the Olympic torch on one leg of its ceremonial journey from Olympia, Greece, to Lake Placid — a journey partly mapped by a computer. Story on Page 10.

DEC Unveils Emulator That Lets PDP-11 Run In SNA-Based Nets

By Marcy Rosenberg
CW Staff

MAYNARD, Mass. — Installations building networks based on IBM's Systems Network Architecture (SNA) gained an alternative to IBM's remote SNA systems such as the 8100 with a Digital Equipment Corp. software package that will allow PDP-11 processors to tie into an SNA network.

DEC's RSX-11M/SNA protocol emulator software, priced at $7,000 including documentation and support, lets PDP-11s running under the RSX-11M real-time operating system emulate remote SNA devices, like IBM's 3790 programmable cluster controller, and communicate interactively with an IBM host mainframe.

Providing this capability on general-purpose PDP-11/34s, 11/40s, 11/60s and 11/70s, the software allows the distribution of transaction processing and data base management applications within an SNA hierarchy, according to Allan C. McGuire, DEC's Internet product manager. Currently the SNA emulator package is available only for DEC's RSX-11M operating system.

Previously, DEC computers could communicate with IBM systems only through the Binary Synchronous Control (Bisync) protocol, McGuire noted.

With the SNA protocol emulator, for which a minimum 128K-byte processor is recommended, a PDP-11 can communicate either on a point-to-point line to an IBM host or on a multipoint line with other SNA devices, DEC claimed.

The SNA emulator does not support full remote job entry. Instead, it permits the DEC processor to interface with the SNA network on a task-to-task basis so data between programs residing in an IBM host and in a

(Continued on Page 4)

H.R. 6121 Won't Curb Bell: OTA

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — Increased competition in the communications field is incompatible with the structure of the Bell System, a congressional "think tank" said in a draft memorandum being circulated on Capitol Hill.

As a result, major changes are needed in H.R. 6121, the proposed Telecommunications Act of 1980 recently approved by the Communications Subcommittee of the House Commerce Committee, the draft from the Office of Technology Assessment (OTA) said.

OTA, which was established several years ago to give Congress objective analyses of technology-based legislative issues, said changes are needed in the bill to prevent the phone company from subsidizing its competitive services with revenues from its monopoly services.

The OTA report, which is not yet public, supports the position of computer systems and services vendors, which — with the notable exception of IBM — have been pushing for full separation of Bell Laboratories and Western Electric Co. from AT&T's Long Lines Division and the telephone operating companies. As it stands, H.R. 6121 requires only that marketing activities be lodged in a separate subsidiary.

The OTA draft specifically states:

• Research and development "by the Bell Laboratory funded by monopoly revenues should not be used to sup-

(Continued on Page 7)

U.S. vs. IBM May Wrap Up In May or June

By Connie Winkler
CW Staff

NEW YORK — There may be light at the end of the tunnel in the U.S. vs. IBM antitrust trial.

The five-year trial could be over by May or June, according to Robert J. Staal, head of the Justice Department's trial team — or at least IBM's defense would rest by June or July, according to IBM's less optimistic trial chief, Thomas D. Barr.

With only four IBM fact witnesses and four economists on IBM's witness list, it does seem that the light at the end of the tunnel has been spotted.

"In view of the dispatch with which the case is proceeding, there is no reason to doubt the parties' predictions," according to Chief Judge David N. Edelstein, who has been shepherding the antitrust case through more than 670 trial days.

"Based on my knowledge of what lies ahead in the government's rebuttal, it is my perception that we are very close indeed to the end of this trial," Staal said in a chambers conference last

(Continued on Page 6)

Future 4300 Users Mixed In Reactions to Software

By Tom Henkel
CW Staff

DPers who ordered IBM 4300 series CPUs seem to like the DOS/VSE operating system. Those same DPers, however, are not impressed by IBM's data base management system or most of IBM's optional licensed programs for the 4300 line.

A *Computerworld* survey of 20 prospective 4300 users found that 15 of them, or 75%, plan to take delivery of the mainframes. Five — 25% — are seriously thinking about other vendors.

Of the 15 sticking to the 4300, 12 plan to use DOS/VSE. Most of these users will also use all five VSE-oriented facilities.

VSE/Vsam is the most popular of the VSE utilities, with 11 of 12 VSE sites planning to use it. The VSE/Advanced Functions package is also popular, with 10 DPers scheduling its use.

VSE/Power, a priority scheduling package, and Btam/ES, a data communications support package, are in the plans of nine users each.

VSE/IPCS, a software analysis package, and the Interactive Computer Control Facility (VSE/ICCF) [CW, Feb. 4], did not fare as well among VSE users. Those packages each received eight votes from the 12 users planning to use VSE.

IBM's data base management package, DL/1 DOS/VS, proved the most

(Continued on Page 8)

Optimistic Survey Reports Upward Climb of DP Salaries

By Ann Dooley
CW Staff

CHICAGO — DP salaries continued their overall upward climb last year, but managers of larger installations and nonmanagerial DPers with the longest experience came out on top, according to a recent nationwide survey of computer professionals.

Those optimistic findings of the "1980 Computer Salary Survey" by Source EDP, a professional recruiting firm, contrast with more conservative salary growth figures recently published in an A.S. Hansen, Inc. survey [CW, Dec. 10] and a survey of *Computerworld* readers [CW, Jan. 21].

Although the wage discrepancies among the surveys can be attributed to any number of reasons, one apparent difference among the surveys is the arbitrary definitions of job categories. In other words, similar-sounding job categories could encompass different DP professionals in each of the surveys.

Source EDP's survey of 30,000 in-

(Continued on Page 8)

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Editor E. Drake Lundell Jr.

Managing Editor Nancy French

Senior Editors:
Industry Marcia Blumenthal
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Communications Brad Schultz
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Senior Writer:
Communications Phil Hirsch

Correspondents:
West Coast Jeffry Beeler
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Staff Writers Tom Henkel
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Copy Editors Nancy Fleming
Catherine Marenghi
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Photography Editor Ann Dooley

Editorial Assistants Denise Petski
Martha Taylor

Editorial Cartoonist Jim Orton

Contributors:
Education J. Daniel Couger
Taylor Reports Alan Taylor
Human Connection Jack Stone

For Sales, Circulation and Production contacts, see inside back page.

Please address all correspondence to the appropriate department at 375 Cochituate Road, Framingham, Mass. 01701. Phone: (617) 879-0700. Telex: 95-1153

OTHER EDITORIAL OFFICES:
West Coast: 407 California Avenue, Suite 10, Palo Alto, California 94306. Phone: (415) 328-8064.
Washington, D.C.: 821 National Press Building, 529 14th Street N.W., Washington, D.C. 20045. Phone: (202) 347-6718.
England: Steve Burton, IDG Publishing Ltd., 140-146 Camden Street, London NW1 9PF Phone: 01-267 1201. Telex: 851 264737.
W. Germany: Eckhard Utpadel, CW Publikationens, Friedrichstrasse 31, 8000 Munich 40, Phone: (089) 34-90-61. Telex: 5215350.
Asia: Hidetsuna Sasaki, Dempa/Computerworld Company, Dempa Building, 1-11-15, Higashi Gotanda 1-chome, Shinagawa-ku, Tokyo 141. Phone: (03) 445-6101. Telex: J2424461.
Australia: John P. Costello, Computerworld Pty. Ltd., 3 Bruce Street, Crows Nest, NSW 2065. Phone: 929-5388, Telex: SECCO AA25468.
Brazil: Eric Hippeau, Data News, Computerworld do Brazil, Servicos e Publicacoes Ltda., Rua Alcindo Guanabara, 25/10th floor 20031 Rio de Janeiro, RJ Brazil. Phone: (021) 242-7395 or 263-8046. Telex: 2130838(WORD BR).

Second-class postage paid at Framingham, Mass., and additional mailing offices PN127420. Published weekly (except: a single combined issue for the last week in December and the first week in January) by CW Communications/Inc. Copyright 1980 by CW Communications/Inc. All rights reserved. ISSN 127-420. Reproduction of material appearing in *Computerworld* is forbidden without written permission. Send all requests to Marion Kibbee.

$1.00 a copy: U.S.— $30 a year; Canada, Central & So. America — $50 a year; Europe and Near East — $90 a year; other foreign — $150 a year (airmail service). Four weeks notice is required for change of address. Please allow six weeks for new subscription service to begin.

Computerworld can be purchased on 35 mm microform through University Microfilm Int., Periodical Entry Dept., 300 Zeeb Rd., Ann Arbor, Mich. 48106. Phone: (313) 761-4700. *Computerworld* is indexed: write to Circulation Dept. for subscription information.

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CDC, Sperry File Appeals

I/O Standards Suits Dismissed

By Jake Kirchner
CW Washington Bureau

WASHINGTON, D.C. — The U.S. district court here has thrown out the lawsuits of four computer mainframers that sought to block the implementation of four federal I/O interface standards.

The suits, brought by Honeywell Information Systems, Inc., Sperry Corp., Burroughs Corp. and Control Data Corp., were dismissed when Federal Judge John G. Penn ruled Jan. 30 that federal procurement laws cannot be invoked by vendors in an attempt to influence government decisions on what types of computers to buy.

The decision was reached four weeks after Penn heard arguments on the government's request for dismissal of the litigation. By press time last week, only CDC and Sperry had moved to appeal the ruling; Burroughs and Honeywell were still considering what action, if any, to take in response.

In filing the original suits last October, the four companies asked the court to block adoption of the standards, which they called "arbitrary and capricious." They are slated for governmentwide implementation June 23 [CW, Oct. 22, 29].

Beginning June 23, all medium- and large-scale computer systems acquired by federal agencies must comply with the standards, based on IBM architecture. The companies that brought suit argued that former Commerce Secretary Juanita Kreps exceeded her authority in adopting the standards and that the standards would damage the firms' government business to the benefit of IBM.

No 'Standing'

In his dismissal ruling, Penn said the four companies did not have "standing" under the Brooks Act to bring suit against the government. The Brooks Act, a 1965 amendment to the Federal Property and Administrative Services Act, calls for improved procurement practices and more efficient utilization of federal DP resources.

When arguments on the dismissal motion were heard Jan. 3, Scott Kragie, U.S. attorney representing the Commerce Department, said "no court has ever told the federal government what it has to purchase.

"We do not deny [adoption of the standards] has substantial impact on industry," Kraggie said, but added that the government expects to save approximately $60 million and "those savings have to come from somewhere." Unfortunately, he said, that "somewhere" is from the profit margins of companies like those bringing the suits.

Wang People Among Seven Arrested in Theft of Chips

LOWELL, Mass. — Seven suspects have been arrested, charged and arraigned in connection with the $750,000 theft of semiconductor chips from Wang Laboratories, Inc. here last month, and police expect to make more arrests.

At press time only $100,000 of the chips had been recovered, according to Thomas Dilello, director of corporate security at Wang.

Four of the seven arrested — John Skandier, Joseph Pattalardo, Chris Carney and Spiro Kronstantoplus — were Wang employees. Skandier was an engineering aide and the other three were material handlers in the stock room, according to the police.

Although most of the men had worked at Wang for only a short time, both the police and Wang said they are currently discounting the theory that the men obtained jobs at the company in order to pull off the theft.

The heist was believed from the beginning to be an inside job [CW, Feb. 4]. In their investigation, police first questioned employees who were in the facility at the time of the robbery or who had access to the stock area, Dilello said.

Upon questioning, one of the alleged thieves was willing to cooperate with the authorities and disclosed the names of some of the others allegedly involved, Dilello said.

This Week

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4	Mobil	29	Westinghouse Electric
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6	Standard Oil of California	31	Beatrice Foods
7	International Business Machines	32	United Technologies
		33	Occidental Petroleum
8	General Electric	34	Bethlehem Steel
9	Gulf Oil	35	Union Oil of California
10	Chrysler	36	Xerox
11	International Tel. & Tel.	37	Rockwell International
12	Standard Oil (Ind.)	38	Esmark
13	Atlantic Richfield	39	Kraft
14	Shell Oil	40	Boeing
15	U. S. Steel	41	General Foods
16	E. I. du Pont de Nemours	42	LTV
17	Western Electric	43	Standard Oil (Ohio)
18	Continental Oil	44	Ashland Oil
19	Tenneco	45	Monsanto
20	Proctor & Gamble	46	Philip Morris
21	Union Carbide	47	R. J. Reynolds Industries
22	Goodyear Tire & Rubber	48	Firestone Tire & Rubber
23	Sun	49	Amerada Hess
24	Caterpillar Tractor	50	Minnesota Mining & Manufacturing
25	Eastman Kodak		

TIME! If you marked (c)–42 users–congratulations! You have a very high Sorting Aptitude, and you automatically become a member of the world-renowned SyncSort Hall of Fame.

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Düsseldorf: SyncSort Technology GmbH, Tel.: 49-211-48-03-51
Johannesburg: Computing Benefits Ltd., 46-2083
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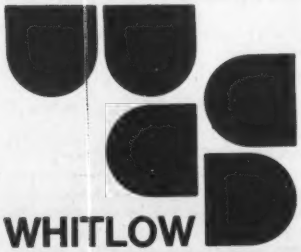

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Decnet Phase III Begins; Vendor Promises X.25

By Marcy Rosenberg
CW Staff

MAYNARD, Mass. — Digital Equipment Corp. christened Decnet Phase III last week with several software upgrades that answer past criticisms of the network and provide networking features that reportedly are not yet available from IBM or other vendors.

And in response to pressure to support the X.25 protocol for public packet-switching networks, DEC officials also promised upgrades over the next 24 months to make Decnet Phase III compatible with the various X.25 implementations. The first of these will probably be offered for the RSX-11 operating system, the firm said.

Capabilities added in Phase III include communications support for multipoint lines, dynamic adaptive routing of messages between nonadjacent nodes, fully distributed or centralized network management and command terminal access to remote systems.

At this time, Phase III can only be implemented on PDP-11 processors using DEC's RSX-11M, RSX-11S and RSX-11M-Plus operating systems, according to Stephan Johnson, Decnet product manager.

Describing Phase III capabilities, Johnson said the ability to support multipoint, or multidrop, lines enables up to six remote, or slave, systems to communicate over a single line with a host, or master, system that controls communication and polls each slave system in turn. Prior to Phase III, Decnet users could implement only point-to-point communications between pairs of nodes that were directly physically connected.

Multipoint networks reduce user line costs, Johnson claimed, because fewer lines are needed for an equivalent number of nodes in a point-to-point network. In a four-node point-to-point network, for example, each node requires three lines to be able to communicate with every other node.

Multipoint configurations can exist as subgroups within larger nets, Johnson said, to allow master and slave systems to participate in message routing, file transfer and resource access with other systems.

Least-Cost Routing

Another Phase III cost-cutting feature not available on earlier Decnet generations is what DEC termed adaptive path routing, a capability through which the network can automatically select the least-cost path — where more than one path exists between source and destination nodes — according to line values assigned by the network manager.

Said to permit one Decnet node to send messages to any other through as many as five intermediate nodes, this routing capability enables each node to store a routing table with least-cost values for the entire network, Johnson explained.

The least-cost routing tables are automatically generated when the software comes on-line and can be updated whenever line status changes occur. Therefore, if service is interrupted on any network link, Decnet reportedly can automatically reroute messages across the next least-cost path.

Although file transfers will take longer, service will not be interrupted. Decnet Phase II users did not have such backup, Johnson noted; the network could not automatically adjust when a line went down.

Network Management

Turning to Phase III network management capabilities, these functions, though not totally automatic, can be centralized or fully distributed across all nodes to monitor communications loads, error rates, line condition and node status at all network points.

In case of a failure, Phase III's ability to dynamically adjust line values allows managers to perform system, interface and line testing while network operation continues, Johnson pointed out.

Finally, network command terminal software is said to allow terminal users at one node to perform standard terminal functions on any other node using the same operating software as if the terminal were local to the remote system. Initially, this interface is supported only between similar operating systems, but will be user-transparent as Phase III is offered on operating systems other than RSX-11.

The extended customer support plan is bundled into the cost of the Phase III software. One-time license fees are $3,500 for Phase III software running under RSX-11M (compared with $2,900 for Phase II); $5,000 for Phase III running under RSX-11M-Plus; and $1,500 for RSX-11S. First deliveries are slated to begin at the end of the month.

NAS Unveils Unbundling, Short-Term AS/5000 Leases

PALO ALTO, Calif. — To attract users to its AS/5000 system, National Advanced Systems (NAS) is offering short-term operating leases for the first time and has unbundled software support and added a VM assist feature.

Besides offering 24- to 60-month operating leases, NAS is evaluating even shorter lease periods — perhaps as short as 12 months, according to Robert Wilson, marketing director for medium systems and add-on memory. Until now NAS has offered only full payout lease terms or purchase options.

The NAS lease prices are 30% below comparable IBM prices, Wilson said.

As for software support, AS/5000 users may now opt to pay separately for Local Program Support Services. This local support option is priced at $700/mo.

In addition, by using additional microcode space available in the AS/5000, NAS said it can provide additional performance to VM operating systems.

The added Assist feature is for Extended Virtual Machine Assist (Evma) including additional support for Virtual Interval Timer Assist. Evma sells for $6,000 or leases on two-, three- or four-year plans at rates 30% below IBM's, Wilson said.

NAS is also offering at no charge a 370 Extended Facility.

Emulator Links PDP-11s to SNA Nets

(Continued from Page 1)

PDP-11 system can be exchanged, McGuire explained.

Three levels of access to SNA protocols are available: emulator control (EC) mode, extended emulator control (XEC) and application control (AC). EC mode can be used to send data to a CICS, Vtam or Tcam application, but the user is responsible for writing program code to cover the end-user level in the SNA system.

With XEC, a user gains more support of SNA protocol options but is required to write applications for the SNA presentation services level as well as the end-user layer. XEC was designed for users that want to interface with IBM's IMS data base management system and provides direct access to the SNA data flow control level for sequence numbers and bracketing information.

The AC mode emulates the SNA transmission subsystem for direct access to the transmission control layer, which establishes sessions or logical links, the path control layer, responsible for physical message routing; and the data link control layer.

AC requires the most knowledge of SNA since users will need to develop application programs under RSX-11M to cover the end-user, presentation services and data flow control SNA protocol layers, McGuire pointed out.

Supports 61 Connections

The SNA protocol emulator software reportedly can maintain up to 61 concurrent, interactive logical connections with one or more programs in the SNA host. It uses IBM's Synchronous Data Link Control (SDLC) line protocol and is said to support up to four synchronous lines at speeds up to 9,600 bit/sec per line.

DEC's protocol emulator can be used as a memory-resident package or in conjunction with a KMC11-A microprocessor-based communications interface for greater line efficiency, according to McGuire. The emulator itself requires 16K to 24K bytes of memory; 1K byte is required for buffering for each session, he added.

Deliveries are set to start in April for the SNA emulator software, which is said to include network management features for fault isolation and line evaluation.

Muscle to Compete

DEC feels its SNA emulator capability on PDP-11s gives it the muscle to compete with IBM's 3790 programmable cluster controller as well as its not-readily-available 8100 and 4300 systems, all of which can function as remote SNA devices.

Other potential competitors include the Burroughs Corp. B687 communications processor introduced last October and said to be SDLC-compatible, and Computer Automation, Inc.'s Syfa Autonet which was announced in July 1978 and reportedly can talk to SNA networks through SDLC or Bisync.

Comparing the 8100 to a PDP-11 with SNA emulator capability, McGuire stated one DEC advantage is that the RSX-11M operating system can support multiple languages such as Cobol, Fortran and Basic. Although IBM had announced that Cobol for the 8100 would be available last month, the product has been delayed until April 30.

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Better Price/Performance Than 5110

Fishing for First-Time Users, IBM Adds 5120

By Jeffry Beeler
CW West Coast Bureau

SAN FRANCISCO — IBM went fishing again for first-time users and last week baited its hook with a small business system that reportedly offers a triple lure of increased price/performance, expanded support and enhanced operator convenience features.

Described as an extension of the IBM Series 5100 line, the newly introduced 5120 typically provides 21% more price/perfonmance than the firm's two-year-old 5110, a company spokesman said.

The main reason for the 5120's purported price/performance edge is said to be its price, not its performance. In architecture and computing power, the 5120 and 5110 are said to be virtually indistinguishable.

In addition to providing more "bang for the buck" than the 5110, the 5120 comes with a package of software, training and support aids aimed at simplifying the system's operation and programming for nontechnical users. Some of these aids, which were introduced at the same time as the 5120, include:

- A set of six licensed application programs, including billing, inventory control, payroll, general ledger, accounts payable and accounts receivable.
- Two enhancements to IBM Business Report Application Development System II, a data base management and application development tool originally introduced with the 5110.
- A three-part customer-support package consisting of an operator training module with a cassette tape and instruction manual; a "get-ready" module, which gives users instructions on how to automate a manual file; and a reports documentation module.

Support Center Opens

IBM also used the 5120 introduction as an occasion to announce the opening in Atlanta of its Installation Support Center, which users can reach through a toll-free telephone number to request help in solving their implementation or application-development problems.

In other parts of the 5120 introduction, IBM last week announced cuts in the cost of its 5110's incremental main memory.

As a result of the price reduction, a 16K-byte 5110 main memory increment that formerly cost $1,175 now sells for $785, the spokesman said.

Twelve Possible Models

Aimed primarily at business and professional users with little or no computing expertise, the 5120 incorporates a Model 5110/3 CPU, at least 16K bytes of main memory expandable to 64K bytes, a 1,024-char. CRT terminal with keyboard, two 1.2M-byte Model 5114 floppy diskette units and a choice of either an 80 char./sec Model 5103/11 or 120 char./sec Model 5103/12 matrix printer.

Among its other standard features, the system offers a choice of Basic or APL programs or both. Depending on which languages and how much main memory a user specifies, the 5120 can be configured into any one of 12 models, the IBM spokesman explained.

Although intended primarily as a stand-alone system, the 5120 can also serve as a node in a distributed processing network built around a System/34, 370 series, 30 series or any other IBM CPU. An optional bisynchronous communications adapter allows the system to communicate with a host processor at speeds up to 4,800 bit/sec in either the 3741 and 2770 line protocols while an asynchronous adapter permits 2741-type communications at either 134.5- or 300 bit/sec, the spokesman said.

One System Ready Now

Available through IBM's 50 U.S. Business Computer Centers as well as its branch sales offices, the 5120 ranges in cost from $9,340 to $23,990, depending on the configuration. The 32K-byte system with Basic is ready for delivery now, and the remaining 11 models will become available by mid-April.

Each of the 5120's six application packages are available for a $60/mo license fee, which is payable for two years. Deliveries of the payroll program begin late this month, and shipments of the rest — except billing — are scheduled to start in March.

More information about the 5120 is available from IBM's General Systems Division, Box C-1645, Atlanta, Ga. 30301.

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Some Upkeep Costs Rise 33%

Memorex Hikes Lease, Purchase, Maintenance

By Marcia Blumenthal
CW Staff

SANTA CLARA, Calif. – Still another victim of inflation, Memorex Corp., yielded to pricing pressures last week by hiking maintenance fees up to 33% and lease and purchase prices up to 15% over the spectrum of its DP product line.

The revised prices were effective Jan. 28 for new users, a Memorex spokesman said, adding that price increases for current users will be phased in depending on their maintenance and lease contracts.

Prices for Memorex's 3652 large disk subsystem with 635M bytes of storage were raised 15% for purchase, lease and maintenance. The Model 3650 with 317.5M bytes of storage, comparable to IBM's 3350 disk system, was increased 7% on lease, but no changes were made in purchase or maintenance prices.

The costs of the remaining disk systems offered by the Large Storage Systems Group were generally raised 7% on lease and 15% on maintenance, the spokesman said.

On the whole, tape systems, including the 3320 systems, were hit with a 24% price increase in maintenance and hikes of 8% on lease and 5% on purchase.

Hardest hit by maintenance price hikes, some reaching 33%, were products offered by the Communications Group. Of these, the 2089 line printer had some increases up to 33% for maintenance. Lease prices for the 2089 escalated up to 15%, but purchase prices were unchanged.

For the Model 1377 CRT terminal, purchase and lease prices remained unchanged, but maintenance was hiked up to 25%.

Similarly, purchase prices for the Memorex 1371 and 1372 terminal controllers were unchanged, but maintenance jumped up to 14%. And for some isolated product configurations, lease prices rose 38%.

Revised charges are based on specific configurations for various products. At press time, Memorex was unable to provide examples of the configurations to the steepest increases.

Lease prices for the 1380 programmable communications controller increased 8%, but purchase prices were reduced 13%. Maintenance remained unchanged.

The price of the hard-wired 1270 communications controller did not change, but its lease rates were raised 6%.

At the Business Systems Division, purchase prices for equipment remained the same, but lease price hikes generally hovered at 7%.

While maintenance increases averaged about 10% for products in the Business Systems Division, monthly maintenance for the Memorex 750 line/min printer, comparable to IBM's 650 line/min 1403-002 printer, increased 25% from $240 to $300.

Memory products generally did not experience maintenance or lease increases, nor did Memorex's Model 41 data entry device.

The increases came less than a week after Memorex announced deflated earnings for fiscal 1979.

Earnings for the year totaled $31.5 million or $3.91 per share, down significantly from the $41.9 million or $5.64 per share earned for fiscal 1979.

Despite the reduced earnings, annual revenues climbed 12% to $737.8 million compared with 1978 revenues of $633.3 million.

A Stiff Price to Pay

Although Memorex Corp. assured users that its maintenance price hikes would not exceed 33%, two users contacted *Computerworld* shortly after receiving notices of their price increases, one claiming his maintenance fees jumped 76% and the other 75%.

In response, a Memorex spokesman said those customers probably either had no contracts or contracts that were signed several years ago and were due to expire.

"If a customer signed a three-year contract three years ago, we honor the original prices for the life of the contract," he explained. However, when the customer is ready to enter into a new contract arrangement, the latest prices go into effect, making the increase seem a lot stiffer.

One customer said his monthly maintenance fee for a disk drive rose from $88 to $153. However, the Memorex spokesman pointed out that the current fee for a Model 660 drive is $135/mo; the $88/mo fee is a much older rate.

Moreover, the spokesman claimed Memorex has made only one 10% across-the-board increase for maintenance in the past six years, even though its maintenance contract allows a 10% increase annually.

Twenty-Four-Hour Bank Service Nods Off

NEW YORK – Although Citibank, N.A. claims "The Citi never sleeps," its 24-hour banking system here nodded off last week.

A team of well-intentioned Citibank DPers recently decided to give Spanish-speaking New Yorkers a helping hand.

The DPers prepared a program that would supposedly make some of the English-Spanish translations of the automated teller's instructions easier to read. The program failed, and so did some 400 around-the-clock banking stations in five New York boroughs.

The stations refused to make any sort of transaction – they would neither accept deposits nor give up cash, a bank official said.

In the 10 hours that followed the software error, Citibank found out just how many people like to do their banking in the middle of the night. The bank was flooded with thousands of irate calls from users anxious to withdraw or deposit cash.

Complaints included one from a woman who had promised to pay her sister's way to Florida – and her sister was leaving about eight hours before the system came back up. Another bank customer who overdrew his checking account by about 12 checks decided sometime in the early hours of Feb. 1 that it would be a good idea to put some money in his account.

It was around 5 a.m. when Citibank figured out what went wrong. Bank DPers took off the new program, put the old one back on-line and made the language corrections manually.

That process took about five hours. By 10 a.m., 87 of the 24-hour banking machines were back on line, and the rest came up later that afternoon, according to a bank official.

Citibank did not disclose exactly what system it is using. A bank spokesman said the system is a combination of hardware put together by its subsidiary, Transaction Technologies, Inc. The spokesman said he could not give additional details.

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U.S. vs. IBM May End in June

(Continued from Page 1)

week.

Barr would not comment on the rebuttal part of the case. "I think it's conceivable that our case, assuming we work out a way to solve the documents and assuming that the relief motion doesn't present a big problem, I think it can be over in the June-July area," Barr told the court.

IBM began its defense April 26, 1978. The trial began May 19, 1975.

Rebuttal gives each side opportunity to comment on what the other side has presented. Staal indicated the government's rebuttal case will be short, and Barr has said previously that the length of IBM's rebuttal will be based on what the government does.

The relief issue – how to divest IBM if it is found to be a monopoly – is still one of many unanswered questions in this mammoth case. On Jan. 17 last year, the government presented its relief motion to Edelstein, but oral arguments on that move have never been heard. Feb. 25 has now been set for those agruments.

Interconnect Amendment Urged for H.R. 6121

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — An amendment aimed at "bringing interconnection specifications out of the shadows" is about to be submitted to the House Commerce Committee in the hope of getting it incorporated into H.R. 6121, the proposed Telecommunications Act of 1980.

This bill, which would replace the Communications Act of 1934, was passed last month by the Commerce Committee's Communications Subcommittee [CW, Feb. 4]. Action by the full committee is likely within the next few weeks.

As presently drafted, H.R. 6121 allows the Federal Communications Commission (FCC) to control interconnection of on-line terminals, systems and facilities, but only where regulated communications carriers are involved. Furthermore, it says nothing about public disclosure of interface specifications.

The Computer & Communications Industry Association (CCIA) believes that if the interconnection provisions of H.R. 6121 are not changed, data communications users gradually will be taken captive by one carrier or another and end up "paying more for less," as association official put it.

In addition, the lack of universal interface specifications, by restricting competition, will frustrate a major goal of the bill.

"It's a little ironic that Congress doesn't appear to be aware of this problem," a CCIA spokesman said. "Xerox Corp. supports the need for interface compatibility even though its proposed Xten [Xerox Telecommunications Network] electronic message service would be among those likely to develop a captive customer base if nonstandard interfaces were allowed."

Universal Interconnection

The FCC has also recognized the need for universal interconnection, the CCIA spokesman said. He explained that when it granted operating authority to Satellite Business Systems three years ago, the commission specifically required adoption of "reasonable and nondiscriminatory terms and conditions with respect to interconnection of customer-provided communications systems and/or terminal equipment."

The amendment which CCIA wants incorporated into H.R. 6121 says interconnection on nondiscriminatory terms must be provided by any carrier which owns or controls transmission facilities, not just those carriers regulated under other sections of the bill.

CCIA also wants a "public disclosure" section. It would apply to any carrier that owns or controls transmission facilities and is affiliated with a manufacturer of terminal equipment or telecommunication systems.

Under this latter provision, all "interface specifications and related protocols" would have to be disclosed, together with "any new or modified network architecture."

OTA Says Bill Won't Curb Bell

(Continued from Page 1)

port equipment development for services offered on a competitive basis unless such R&D results are also made available to competitors on an equal basis."

- "Manufacturing activities of Western Electric for competitive and monopoly services must be separated to ensure that no cross-subsidies can take place or alternatively, Western Electric must offer its products to all carriers on equal terms."
- "Where facilities are shared for monopoly and competitive services, an equitable cost allocation must be found."

Further Suggestion

If Congress passes legislation saying that competition is to be encouraged and making it illegal for monopoly service revenues to subsidize competitive offerings, AT&T will comply with these directives, the report said. However, it made a further suggestion:

"In recognition of AT&T's importance to the nation and of its privileged monopoly position in many areas, it may be appropriate to have some government-appointed directors on AT&T's board to provide public visibility of overall Bell System policies.

"Under supervision of the board, AT&T's management would institute procedures designed to avoid cross-subsidies and other anticompetitive practices. At all levels of Bell management, there would be a substantial incentive for compliance with the law and with AT&T objectives, since lack of compliance would risk the professional career of the individual within the Bell System, as well as personal legal liability.

"All employees would know that noncompliance would not only be a risk to them personally but eventually also to AT&T's continued integrity."

OTA concluded that if new communications policy is not enacted, "disputes over cross-subsidies and cost-accounting systems will continue unabated" for several years.

The Federal Communications Commission will have very little ability to ascertain the true costs of AT&T's services, and it is likely that a succession of AT&T tariffs will continue to be found unlawful but will nonetheless be continued in effect."

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Air Controllers Suspected In Soviet Jet Incident

By Marguerite Zientara
CW Staff

NEW YORK — The Federal Bureau of Investigation is looking into official charges that air traffic control data on a Soviet Aeroflot airliner carrying Ambassador Anatoly Dobrynin was removed from computerized radarscopes at Kennedy International Airport on Jan. 18.

The incident resulted in the Aeroflot jet's flying about six miles at the wrong altitude in the normally crowded skies over Long Island. Observers commented it was "just plain lucky" that the jet was not endangered.

Six air traffic controllers have been subpoenaed for questioning in the case before a grand jury in Brooklyn tomorrow "because at one point there were several who refused to answer our questions regarding the investigation," Walter Yoos, FBI special agent at Kennedy, stated.

Suspected Sabotage

Federal Aviation Administration (FAA) officials, who brought the FBI into the case on Jan. 29, suspect that an air traffic controller at one of 20 radarscope consoles deliberately deleted alphanumeric data describing the Aeroflot radar "blip's" flight name and number, altitude and ground speed, a spokesman said.

The potentially dangerous incident occurred at a time when members of the local chapter of the Professional Air Traffic Control Organization (Patco) were on record as objecting to handling either Soviet or Iranian airliners. The local chapter of Patco had posted a notice on the bulletin board at the Common Instrument Flight Rules (IFR) Room at Kennedy telling members not to handle such craft unless so ordered by their superiors.

As for the removal of the data tag from the radarscopes, however, Patco Chapter President Anthony Maimone said the group "does not condone such action and, in fact, if someone did that, the proper action should be taken.

"We're not in the business of hurting anyone; we're here to guide the airplanes in," he added.

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Salary Findings Optimistic

(Continued from Page 1)

dividual professionals and 14,000 client organizations showed that managers' salaries increased according to the size of the installation. Source EDP defined "small" installations as those using IBM 370/125 or smaller systems; "medium" as those using systems ranging from an IBM 370/125 to a 370/145; and "large" installations as those using systems bigger than the 370/145.

Median Salaries

The survey showed that the national median salary of operations managers ranged from $23,700 for those in small installations, $27,000 for those in medium installations, up to a median high of $32,100 in large installations. In 1978, operations managers in medium installations earned $24,300 and those in large installations earned $29,900, the firm said.

The national median for systems and programming managers last year was $29,400 in small shops. Median income in medium installations was $34,200 as opposed to 1978 figures of $32,700, and those working in large installations garnered $38,500 in 1979 compared with $35,800 in 1978, the survey found.

Information systems directors in small DP shops earned a $32,200 median salary, while those in medium installations earned $39,000 and directors working in large installations earned $46,900 — the highest median salary in the survey. The 1979 figures show an increase from the previous year's figures of $29,200, $34,400 and $43,400 for small, medium and large shops, respectively.

Nonmanagement job categories were broken down according to more specific job functions than in past years and so are difficult to compare with 1978 figures. Salary amounts indicated, however, that higher wages were directly tied to the length of professional experience, as last year's survey also indicated.

Senior analysts, project leaders and consultants with two to four years of experience earned a national median of $24,300. Those with four to six years of experience earned $27,500, and those with more than six years earned $31,200 in 1979, the survey showed.

Commercial programmers and programmer analysts with six months to one year of experience earned a median salary of $15,300; after working one to two years, their salaries rose to $18,400. Median salaries for those with two to four years of experience increased to $21,000, while those with more than four years of experience averaged $24,000, according to the survey results.

Last year, systems programmers with one to two years of experience earned $20,700. Salaries reached $24,400 for those with two to four years of experience, topping off to a median salary of $29,400 for more than four years of experience.

The survey is available free from Source EDP at 100 S. Wacker Drive, Chicago, Ill. 60606 or from any of its regional offices.

Users Planning DOS/VSE

(Continued from Page 1)

unpopular among IBM base licensed programs. Three users said they plan to use that package.

Most users polled said they don't care for DL/1 and will buy a similar package from other vendors. Each of the users, however, plans to use a data base management system.

IBM's Installation Productivity Facility (IPF) also proved unpopular. Five DPers plan to use it.

Since most of the surveyed users are upgrading from IBM 370 mainframes, CICS DOS/VS remains popular. Nine 4300 users will stick with that package, according to the survey.

Not Faring as Well

IBM's optional licensed programs are not faring as well as the VSE utilities. Of 18 programs in this category, only three seem to be popular.

The Data Interactive Testing and Operation (VSE/Ditto) utility will be used by 10 of 12 VSE users. Cobol/VS will be used by 10 of 15 DPers accepting 4300s; some of those users will stick with DOS/VS.

The new disk sorting system, Sort/Merge II, will be used by nine DPers.

Five DPers will use RPG-II on their 4300 CPUs; however, none set their sights on PL/I. Four of the 18 optional IBM programs are PL/I-oriented.

None of the users surveyed care for IBM's data base/data communications data dictionary. The general consensus among users was that IBM's offering, like its data base manager, DL/1, is not as good as those from other vendors.

However, as with DL/1, the polled users did not show a clear preference for a particular package from another vendor.

Although DPers are staying loyal to CICS, the optional programs for use on CICS are not going over well. CICS/VS PA-11, a performance analyzer, got one vote, as did VSAPL. None of the users polled plan to use the Interactive Instructional System (IIS) designed to operate on CICS.

DMS/CICS/VS-DOS and a generation package for that disk management system are also unpopular. Only one of the 15 users polled plans to use those packages.

Remote job entry is also proving an unpopular feature for 4300 users. Two optional RJE packages are available from IBM: VSE/Power/RJE, which recieved two votes, and the DOS/VSE RJE workstation, which received one vote.

Five users said they haven't given IBM software much thought because they have been busy thinking about other vendors. Those DPers, who aren't sure whether they will accept delivery of either a 4331 or 4341 CPU, mentioned Wang Laboratories, Inc.'s VS system and Burroughs Corp.'s B1900 as possible alternatives.

Software has been on the minds of two users, however. Those users decided to delay moving to DOS/VSE and remain with DOS/VS even when they get their 4331s.

One user said he was forced to make that decision because he wants to operate his 370/125 in tandem with the 4331. He said he cannot use DOS/VSE on the 370/125 and he wants the option of switching programs between machines.

In Response to FCC Criticism

AT&T Proposes Changes in Private-Line Tariff

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — AT&T has proposed a basic restructuring of its private-line services in response to repeated complaints from the Federal Communications Commission (FCC) that existing rates force some users to pay more than they should and discourage competition.

Basically, the 26 private-line tariffs presently on the books would be replaced by six new ones. The bulk of the offerings would be covered by two tariffs — one entitled "Basic Private-Line Channels" and the other "Augmented Private-Line Services."

The "Basic" tariff would list prices and terms for "communication piece parts." It is designed for "those customers who, by virtue of their own capabilities, are able to establish their own communications systems," AT&T explained. "These customers want the ability to obtain elemental private-line components — or piece parts — from various suppliers, including AT&T, for the purpose of creating communications services of special value to themselves or others."

The "Augmented" tariff, by comparison, "focuses on services which involve more than a collection of elemental private-line components. The demand for these services is expressed in the form of requests for end-to-end, assembled offerings, characterized by special features, often available on an optional basis."

Four Remaining Tariffs

The remaining tariffs encompass terminal devices, audio and TV transmission services, overseas private-line services, "transitional private-line services" and "miscellaneous and experimental private-line services."

The overseas tariff would contain rates and regulations now embodied in AT&T's Tariff 260, while the company's Tariff 258 would continue to cover "miscellaneous/experimental" services.

The "transitional" tariff would "accommodate offerings in the later stages of their life cycles," AT&T said. "The inclusion of an offering in this tariff will provide a clear market signal that the service is not expanding and may eventually be withdrawn."

Among the offerings to be included in this tariff initially are Series 1000 telegraph services and a 50K bit/sec "wideband (only)" data service which is now in the Series 8000 portion of Tariff 260.

End to DDS, Telpak

AT&T's present Dataphone Digital Service (DDS) and Telpak tariffs will disappear if the proposed restructuring is implemented. Both services have been embroiled in controversy for years.

Under the new arrangement, the piece parts needed for DDS will be provided by the "Basic" tariff, while the end-to-end service will be among those included in the "Augmented" tariff.

Telpak would continue to be offered only to existing customers and only until a pending court case is decided. The basic argument confronting the court is whether Telpak channels should be resold and/or shared by value-added carriers, industry-based user groups and others.

AT&T has said that if resale/sharing is allowed, Telpak won't be "viable."

Response to Criticism

AT&T proposed the new tariff structure in response to an FCC decision last fall, the latest in a long line of pronouncements criticizing the phone company's cost-allocation procedures. According to the commission, virtually all of AT&T's major tariff filings "since the introduction of substantial competition into interstate telecommunications have fallen into a regrettable cycle. The filing invariably raises controversy and often is set for a hearing.

"Ultimately the hearing results in a finding of unlawfulness . . . However, when such tariffs have been refiled . . . they generally have engendered as much controversy . . . as the tariffs they were intended to replace."

The commission added that among the factors contributing to this problem have been "attempts" by AT&T "to accord . . . generally more preferential treatment to customers using AT&T-provided instrumentalities than . . . to customers using equipment supplied by . . . AT&T's competitors."

In the hope of ending the "regrettable cycle," the commission proposed a set of guidelines for AT&T to follow in restructuring its private-line tariffs. A basic aim of these guidelines is to prevent AT&T from pricing its competitive services at below-cost rates, thereby forcing customers of its non-competitive services to pay more than they should and frustrating the marketing efforts of other common carriers as well as independent terminal manufacturers.

The big question at the moment is whether AT&T's restructured private-line tariffs will prevent anticompetitive cross-subsidies. The answer may begin to emerge Feb. 22 when interested parties submit to the FCC their comments on the proposal.

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From Greece to Lake Placid

Olympic Torch Ends Computer-Mapped Trek

By Tim Scannell
CW Staff

LAKE PLACID, N.Y. — In what could be described as a temporary marriage of historical tradition and modern technology, the Olympic flame will be lit here this Wednesday by a torch that followed a partly computer-mapped path from ancient Greece.

The torch was scheduled to arrive here at the Olympic Village last Friday and is currently being stored under guard in the Olympic arena.

Upon arriving in the U.S., the torch was relayed by 52 runners — one from each of the 50 states, Washington, D.C. and Lake Placid — along a route timed and scheduled by a Texas Instruments, Inc. DS990/10 minicomputer system here at the Olympic Village. The journey stretched for nearly 1,000 miles and took the burning symbol through six of the original 13 American colony states — Virginia, Maryland, Pennsylvania, Delaware, New Jersey and New York, a TI spokeswoman said.

Torch Trek

The torch started its trek in Olympia, Greece, where the first games were held in 776 B.C. as part of a religious ceremony. From there, a runner carried the torch to the Athens airport and placed it on an airplane, bound for the Langley Air Force Base in Virginia.

The Olympic Torch Relay Route Schedule software, written for the ceremonial trip, was designed to provide "minute-by-minute" accounts of the runners as they passed 1,069 checkpoints and visited various towns along the way, according to Eileen Cornwell, a programmer/analyst with the Lake Placid Olympic Organizing Committee (LPOOC). The program was run on the same computers and terminal network that will be used during the next two weeks to score all of the XIII Olympic winter games here.

The scheduling system was based on a route model containing the distances between each checkpoint, approximately how fast each runner will travel, whether the runner will stop overnight or participate in a town's ceremonies, and what time of day the run was started, Cornwell explained. The software was developed by programmers from TI and the LPOOC.

Pacing Runners

Throughout the journey, a van carrying an LPOOC timing crew paced each runner and provided progress updates to the dual-host minicomputer system at Lake Placid. Reports were telephoned into the Olympic Village where an operator would key in current information and revamp an outdated run schedule, Cornwell stated. In the van, the timing crew used a TI 745 terminal to receive updated data, which was supplied to towns along the route as well as to the media.

Used in a receive-only fashion, the terminal allowed the LPOOC technicians to calculate "how much faster a runner would have to run in order to get someplace on time," Cornwell continued. In case "they did have problems, they could change the pace by, say, .5 of a second" and telephone the update back to Lake Placid.

The basic objective of the scheduling project was to keep people informed during the historic journey. "It adds to it to get people involved along the route," Cornwell observed.

For the most part, the torch relay was carried out without any significant problems. However, back at Olympic Village TI personnel were plagued last week by a power failure that knocked out their TI-Score system for computerized Olympic results and events for at least an hour. Apparently, workmen were laying some new cable and inadvertently shut down the main power supply leading into the village.

A TI spokeswoman said that the company has already installed a backup power facility.

TI-Score consists of two DS990/10 minicomputers, clusters of Model 771 intelligent and Silent 700 portable terminals and Omni 800 data terminals and printers.

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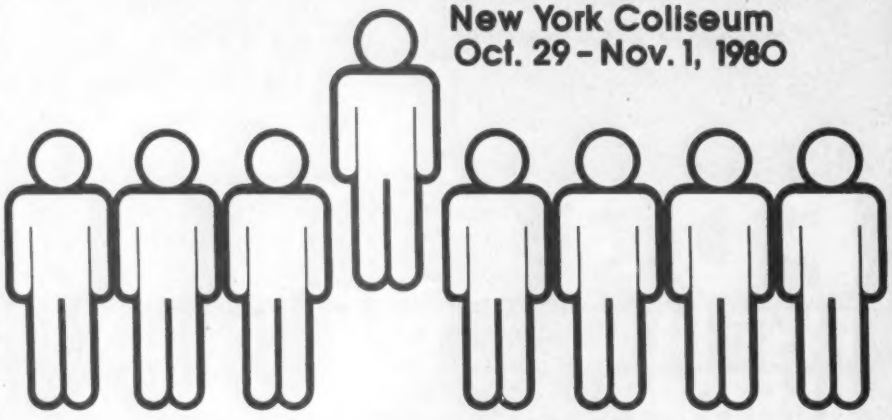

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Seminars Slated On DP Security

PHOENIX — A series of three-day workshops on computer security and privacy will be sponsored by Honeywell, Inc. here beginning Feb. 12, March 11 and May 13.

Using case studies, the workshops will examine the planning necessary for a more secure system. Particular attention will be paid to security responsibility, risk analysis, operations security, internal computer security, physical security and computer auditing.

Conducted by Jerome Lobel, Honeywell's manager of computer security and privacy education, the workshops will feature case histories of actual computer system abuses, including fraud, theft and malicious attack.

The registration fee is $480 including seminar materials and three luncheons. More information may be obtained from the Registrar, Honeywell System Sciences, P.O. Box 6000, Mail Station T99, Phoenix, Ariz. 85005.

Airport Controllers Say Tampa System Unsafe

By Marguerite Zientara
CW Staff

TAMPA, Fla. — Air traffic controllers at Tampa International Airport are working with "unsafe and unreliable" air traffic control (ATC) computer equipment, according to Professional Air Traffic Controllers Organization (Patco) representatives here.

The ATC system under attack is the Federal Aviation Administration's (FAA) prototype Arts III-A, installed last May. Based on a modified Univac I/O processor, the system was designed to track both "primary" and "secondary" radar targets.

The commonly used Arts III system tracks only secondary targets. Secondary targets are those equipped with electronic transponders carrying identification codes that indicate the airline name and flight number, altitude and ground speed, which are digitized and displayed as alphanumeric data blocks on controllers' radarscopes, according to Jack Barker, public affairs officer for the FAA's Southern Regional Office in Atlanta.

Primary targets, on the other hand, are smaller aircraft that are not equipped with transponders. They are detected by radar only and displayed as "blips" on the radarscope, without altitude, speed or identification information. Controllers can then manually input identifying data blocks corresponding to each blip.

System Backfires

While the main advantage of the Arts III-A system is its ability to track all aircraft in an area and therefore reduce the possibility of midair collisions resulting from "unknown" aircraft, there are times when the capability backfires, controllers claim.

In fact, Tampa controllers have dubbed the system "Track-a-Truck," because of its ability to "track anything that flies," and some things that don't fly, including highway trucks and railroad trains, according to Ron Folsom, Patco safety coordinator.

But more serious than mistracking is the controllers' major complaint that the experimental system goes down far too often. From June 11 to Dec. 3, 1979, there were 27 planned failures and 30 unplanned failures lasting from eight seconds to more than two minutes, with more undocumented ones, according to Ron Levesque, director of public relations for Tampa's Patco.

While controlling can be done safely and accurately without computer-generated alphanumeric data blocks, controllers maintain it is the transition period between computerized and broadband radar systems that is dangerous.

Tampa's outages can be traced to the Arts III-A technology, which enables the computer to shut itself down whenever it detects an internal malfunction "bad data" for display, Levesque explained.

"The problem is it doesn't come back up in eight seconds with new, accurate data, as it's supposed to, or it comes up without any data at all," he said. If the system comes back up without any data, Tampa then must call the Miami Air Route Traffic Control Center, where technicians can feed the information back into the computer, a process that takes a minimum of two minutes, he said.

And what has been called the "most sophisticated, advanced radar tracking system in the country" has other problems as well, according to controllers. There are "numerous" instances of erroneous altitude information being displayed, contributing to potential midair collisions, Levesque claimed.

In addition, data tags occasionally drift off the radarscope instead of following the blips they describe, Folsom said. There have also been problems with data tags "flopping," he said, "when, for example, an Eastern flight tag will jump over to a National blip and the National will jump over to the Eastern."

To remedy what they consider an unsafe situation, controllers at Tampa from the start asked repeatedly that their previous Arts III system, which they considered reliable, be reinstated.

Last July, however, the FAA transferred Tampa's Arts III to Chicago's O'Hare International Airport to solve memory problems there.

'Perfectly Safe'?

And while the FAA has consistently claimed the Arts III-A system is "perfectly safe," it has temporarily disconnected several troublesome parts of the system — including primary radar tracking — in response to a recent wave of local publicity warning the flying public of alleged potential dangers.

But the FAA still sees things differently. "We don't consider it dangerous under any circumstances because at least minimal data is available to the controller all the time," John Graffius, chief of the Automation Branch Air Traffic Division of the FAA's Southern Region, said last week.

"It might be arguable that [the outages] are undesirable, but this system has been enhanced to provide this failsafe condition, as opposed to what the old Arts III system could do," Graffius said.

Controllers agree that theoretically it's a better system, but complain that it still needs a lot of work before being put in a "live" environment.

"We just can't tolerate these up-and-down outages while we're working airplanes," he added. "What we're trying to do at Tampa, in Patco, is act — not *react* after somebody has been killed."

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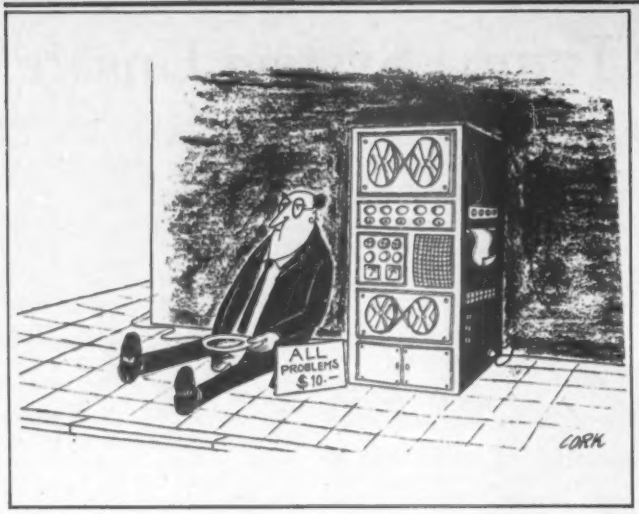

Because of Productivity Gains

Study: Hospital Automation More Than Cost-Effective

By a CW Staff Writer

COLUMBUS, Ohio — Cost savings from increased productivity more than offset the price of an automated hospital information system, according to a three-year study by Battelle Columbus Laboratories here.

The study, initiated in 1971 for the U.S. Department of Health, Education and Welfare, compared El Camino Hospital in Mountain View, Calif., which has automated many of its procedures, with four other northern California hospitals employing conventional procedures for the period covering 1976 to 1979.

El Camino has installed the Technicon Medical Information System (TMIS), made by Technicon Corp. of Tarrytown, N.Y. TMIS stores patient information, lab test results, medication records, admission information, business records and other data for immediate recall and review by authorized hospital personnel.

The system produces, at appropriate times and locations, schedules of patient services to be performed and reminders of care to be administered. An attending physician can, if necessary, obtain a readout of all key information on a patient from the time of admission, regardless of the length of the hospital stay.

TMIS employs a network of terminals and printers placed throughout the hospital and linked to a central computer. Hospital personnel communicate with the computer by means of light pens at the terminals.

A typical installation would link admitting, laboratory, radiology, medical staff, biomedical records, nursing, business office, pharmacy and support services.

Patient Benefits

The report concluded that TMIS was responsible for "a significant reduction" in a patient's length of stay at the 464-bed hospital when El Camino was compared with the other institutions studied.

TMIS "enabled the hospital to provide services to an increased number of patients without adding beds and limiting the facility expansion to less than it otherwise would have been," the report found.

Furthermore, the researchers concluded the system was "effective in improving the ability of the hospital staff to provide patient care-related services at a lower cost, which was one of the objectives of the hospital in implementing the system."

Also cited were "demonstrated benefits both in productivity improvement and quality of medical care." The study recommended that further research should be considered "to determine if similar economic and quality of care benefits can be realized in other hospital environments."

Incentive Study Urged

Referring to the current system of Medicare, Medicaid and private medical cost-reimbursement systems, the report noted, "There is no real incentive for hospitals to reduce expenses under the current system."

The report then recommended an economic analysis of an "incentive reimbursement demonstration project" of the technology and observed, "Incentive based on a reward for realization of system benefits would produce more meaningful results for evaluation of these systems."

Potential barriers to implementation of the system were identified as the "inability to finance transitional and start-up costs as the result of federal and state regulatory programs relating to hospital patient care costs."

The researchers also recommended a study of how "physicians' practices have been changed through their direct interface with the system."

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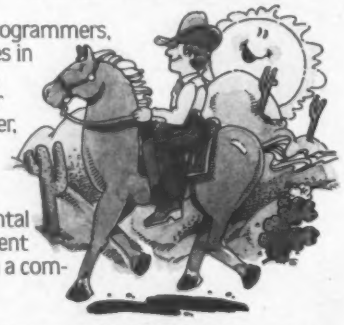

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Pouzin Calls Paperless DP 'Just a Pipe Dream'

By Brad Schultz
CW Staff

WASHINGTON, D.C. — Paperless DP? That is "just a pipe dream," according to the man who directs pilot projects for France's Institute for Research in Informatics and Automation (Iria).

Speaking at the recent Communication Networks '80 conference here, Louis Pouzin observed that "people like paper." As one of the oldest media for human communication, paper will still figure prominently in the age of satellite transmissions and talking terminals, the Frenchman predicted.

Those remarks were rather conspicuous at a conference that presented the federal government's experimental "Paperless Office" [CW, June 4] — billed as a portent of things to come — and other speakers heralding the advent of paperless, all-digital communication.

U.S. Isolation

While noting that most users and industry pundits anticipate an eventual drop in DP's consumption of paper, Pouzin said there is little reason to expect people of other nations to all conform to Ascii, this country's standard code for transmitting text digitally.

In fact, the U.S. may find itself isolated from China, the Third World and other countries should their facilities go paperless, the Iria director suggested.

Those nations might develop and conform to non-Ascii codes if that happens, he explained. That would mean transmissions from Peking, Bombay or Saigon could not be received at conventional U.S. terminals. Likewise, much of the world would find it difficult to receive U.S. traffic.

Why would paper disappear from DP? A trend has begun in recent years to store the large data bases involved in DP in media that computers can interface directly such as flexible disks and computer output microfilm.

In contrast to printer paper, these media allow information to be stored far more compactly and quickly. Moreover, paper has steadily grown more expensive, while large quantities are sometimes hard to obtain at any price [CW, April 9].

According to Pouzin, the simplest approach to establishing electronic mail links between widely separated points on the earth is to transmit images, rather than Ascii translations, of the source text — in other words, via *facsimile* technology, which users have begun integrating with data, voice and video communications in a common satellite channel.

Standards Movement

Pouzin took a dim view of recent efforts to promulgate international standards for data communications products and practices. Years ago, the standards movement seemed like a worthwhile attempt to give users all over the world mutually compatible equipment.

But the standards approved by the International Consultative Committee for Telephone and Telegraph (CCITT) "do not work with each other," Pouzin maintained. As a result, CCITT is now futilely developing more standards to coordinate the earlier standards, he said.

A "maze of standards" will thus "grow indefinitely until we recognize that perhaps we shouldn't have standards any more; the way standards have been approached so far is perhaps not appropriate to technology."

Users may be able to escape this maze if all nations would agree to employ the same processor logic in data transmissions, Pouzin pointed out. Agreement itself might prove more important than the particular logic chosen, he indicated.

Progress Review

In reviewing progress in data communications over the past decade, Pouzin remarked that the advent of decentralized DP may signify the end of computer systems in the traditional sense. "Computers will only be racks of components ... that will be spread [around] geographically.

"It will be like the telephone system," the Frenchman continued. "One exchange has no interest. What has interest is the whole system.

"So a computer by itself will become a stupid piece of hardware; the only thing that will count is the whole development."

Monopoly Rivalries

Pouzin also gave a European's perspective on the rivalry between IBM and AT&T for dominance in telecommunications. He compared the giant corporations to Japanese sumo wrestlers. No one ever wins a sumo bout, Pouzin noted. The wrestlers "just move a little bit."

European Post, Telephone and Telegraph authorities — the state-owned communications monopolies — once considered joining forces with AT&T to prevent IBM from controlling Europe's communications marketplace, Pouzin said.

However, some of those public corporations have subsequently received advice from IBM on how to develop satellite communications services similar to the services planned by Satellite Business Systems, Inc. — a joint venture of IBM and two other firms.

Pouzin compared the situation to the way nineteenth-century Africans sided with the British against the French, or vice versa, but became colonized by their "partner" in either case.

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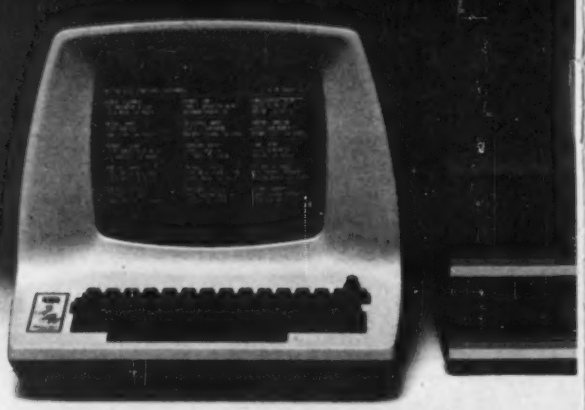

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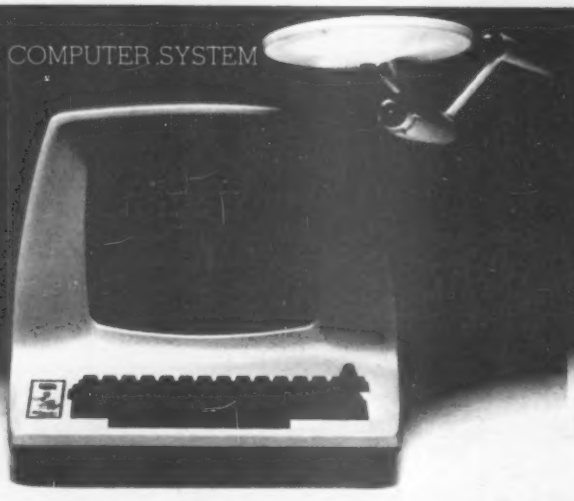

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But we wondered if all 85,000 Dumb Terminals were being used for just everyday data entry. So we checked around.

And found that people are using Dumb Terminals for things even we never thought of.

THE ADM-3A GOES INTO BUSINESS.

More and more OEM's are putting the Dumb Terminal into small business systems. They assemble a package that usually contains a disk, memory, a printer, and a video display terminal — the adaptable ADM-3A.

So the chances are that when you buy a small business system from someone, it'll contain, you guessed it, the amazing Dumb Terminal.

IT TAKES STOCK OF THE SITUATION.

Many businesses are using the Dumb Terminal, along with a light pen (Universal Product Code Decoder), to keep track of their inventory. The decoder is interfaced to the Dumb Terminal, and when a piece of merchandise imprinted with a Universal Product Code passes under it, the item is entered into a computer for tallying.

Simultaneously, the item is also displayed on the ADM-3A's screen — so it's instantly available for quick double-checking.

PROGRAMMERS LIKE IT, TOO.

Surprisingly enough, many computer programmers use the ADM-3A as an effective, portable I/O device. They can take it into a back room or, along with an acoustic coupler, to their homes if they wish, and compile programs nearly anywhere.

By using telephone lines, they can have direct access to a computer. Or, with the addition of an inexpensive cassette, the programmer can store the program on tape and enter it into the mainframe at a later date — with no loss of data.

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We discovered that many computer buffs are using the Dumb Terminal as an inexpensive way to upgrade their systems. After all, the equipment found on most microcomputers leaves a lot to be desired. Such as the tiny five or six-inch screen, for instance.

By upgrading to the ADM-3A, they get a full 12-inch screen that's easy on the eyes. Not to mention a lot of capabilities they wanted, but just didn't get on their systems.

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When you get right down to it, the Dumb Terminal's applications are pretty amazing.

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Managers on the Move

DONALD STUNOFF has been named vice-president of corporate information services at the Quaker Oats Co. in Chicago.

Stunoff joined the company in 1966 as project manager of systems design. He became manager of systems research and design in 1969 and assumed his most recent position as director of corporate information services in 1977.

Prior to joining Quaker, Stunoff was with the Chicago and North Western Railway.

Stunoff attended the University of Wisconsin at Madison and in 1975 completed the Executive Program at Indiana University's Graduate School of Business

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JACK R. CLARK has been appointed director of systems design and development at Philip Morris U.S.A. in Richmond, Va. ROBERT J. MILLER will succeed him as director of computer hardware and systems software.

Clark joined Philip Morris in 1975 as manager of computer hardware and systems software in the Process and Management Information Systems Department. He was appointed director of computer hardware and systems software in 1978.

Prior to joining the company, Clark was manager of technical services for M. Lowenstein & Sons from 1961 to 1975. He studied business administration at the University of South Carolina.

Miller, prior to joining Philip

Stunoff

Morris, was a DP consultant, primarily concentrating on minicomputers and distributed processing.

– – –

Clark

JOHN E. PARADY has been named director of information systems for Weyerhaeuser Co. in Tacoma, Wash.

He will be responsible for all the multinational forest products firm's computer and telecommunications operations and for coordinating information systems activities among the company's five business organizations.

Parady has served as systems manager for the company's Shipping Container Division and fiber business. Most recently, he headed a special information systems planning project.

Prior to joining Weyerhaeuser, Parady held positions with Arthur Young & Co., Norris & Gottfried, Inc. and IBM.

Parady holds a master's degree in management science from the University of Southern California.

– – –

RAYMOND F. FORTHUBER has been appointed corporate vice-president of information services at PHH

Forthuber

Group, Inc. in Hunt Valley, Md.

Forthuber was most recently director of information services at the company. He joined PHH Group last year to manage the company's DP and consulting functions.

In his new position, Forthuber will have the additional responsibilities for developing corporate wide business information systems, voice and data telecommunications and internal methods and procedures.

Forthuber is a graduate of John Hopkins University.

– – –

MICHAEL E. GOLDMAN has been named assistant vice-president of Lincoln National Life Insurance Co.'s Data Processing Division in Fort Wayne, Ind.

Goldman was formerly employed by the University of Illinois as assistant director of administration in the computer center. He held a similar position at Baxter-Travenol Laboratories in Deerfield, Ill.

He joined Lincoln in 1977 as director of systems programming and was promoted to director of communications and information analysis in 1979.

A graduate of the University of Illinois, Goldman earned a bachelor's degree in mathematics and computer science.

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ROWLAND BRANDWEIN has been appointed advanced development manager in the Computer Operations Division at Chas. T. Main International, Inc. in Boston.

Before joining Main, Brandwein was advanced systems development senior planning manager for Digital Equipment Corp.

Brandwein holds a Ph.D. degree from Northwestern University. He also attended the Chicago Institute of Design, the University of Illinois College of Medicine, Indiana University School of Engineering and the Premedical School of Johns Hopkins University.

– – –

ARDOTH A. HASSLER has been appointed coordinator of academic services at the Catholic University of America's computer center in Washington, D.C.

Hassler formerly held a similar position at Central State University in Edmond, Okla.

Hassler has a B.S. in mathe-

Hassler

matics from Oklahoma State University with concentrations in applied mathematics, computer science and statistics.

– – –

Tenney

WEBSTER TENNEY has been named manager of systems development and JOHN SEMPLE has been appointed systems analyst at National Truckers Service, Inc. in Fort Worth, Texas.

Tenney was most recently manager of information services for Pier I Imports in Fort Worth. Prior to that, he was employed by Richfood, Inc. in Richmond, Va., and Polaroid Corp. in Boston. He received his degree from Virginia Polytechnic Institute.

Semple has 10 years analyst experience. Prior to his most recent assignment, he was a senior programmer/analyst for General Dynamics in Fort Worth. He holds a degree from Muskingum College.

– – –

WILLIAM C. ATER has been named vice-president of bank data centers at Anacomp, Inc. in Carmel, Ind.

Ater was formerly assistant vice-president of administration at Anacomp.

In his new position, Ater will be responsible for managing Anacomp's bank processing operations in Indianapolis, Winston-Salem, N.C., and San Francisco. He will also be responsible for the company's credit union processing center.

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Well Above 7% Wage Lid

Indiana DP Salaries Rise 11.2%

By John Whitmarsh
CW Staff

INDIANAPOLIS — The voluntary wage lid that had been holding increases in data processing salaries to 7% in compliance with federal antiinflation guidelines has blown off — in Indiana, at least.

A statewide survey conducted late last year by a personnel agency here found DP salaries rose an average 11.2% in 1979.

The survey also found that female DPers with comparable experience in the same job classifications make 9% less money than male DPers.

The Indiana survey is the first in the country to take a grass roots look at the DP workforce and salary structure on a state rather than a national level, according to Richard Butz, president of Computer Personnel Services, Inc. (CPS). The firm interviewed 704 persons in four DP job classifications and found pay hikes in all of them exceeded the President's 7% antiinflation wage guideline.

Of the four job classifications, programmers in Indiana businesses received the largest salary increases last year, up 13% to an average $14,395. The salary range was from $9,700 to $26,600.

The salaries of programmer/analysts climbed 11% to an average $17,701. The salary range was $13,000 to $26,000.

Systems analysts' salaries rose 11% to an average $21,860 in a range of $15,200 to $28,000. Systems/software programmers' salaries increased 8% to an average $23,863; their salaries ranged from $15,600 to $33,000.

Labor-Short Market

The average 11.2% increase in DP salaries does not necessarily mean companies were skirting the 7% wage guidelines, Butz said, because the President's Council on Wage and Price Stability exempts employers from the 7% ceiling if they can prove labor shortages exist. Butz estimated that a 25% shortage of DP professionals exists in Indiana.

"Indiana has a labor-short data processing market. In this kind of market, the laws of supply and demand take over," he said.

Butz emphasized that some companies are "extremely strict" in meeting the 7% guideline but that they are often caught "in a cross fire between the work they must turn out and the people thay cannot afford to lose.

"A project can be destroyed by a single person leaving right in the middle of it," Butz said. "As a result, we see tremendous increases in salary just to be able to complete a project. That explains the occasional 25% to 35% jumps in salary, depending on how key a person is."

While unemployment in the Indiana work force hovers around 6%, the demand for DP personnel is so strong that unemployment among them is practically nonexistent. Of the 704 DPers interviewed in November and December, the study found only three unemployed.

The survey also found the highest turnover among the lowest paid jobs. For example, programmers, who earned an average $14,395, had the highest turnover rate — 24%. Programmer/analysts, who made an average $18,032, turned over 19%. Systems analysts, who earned an average $21,860, turned over 9%. And systems/software programmers, who grossed an average $23,863, turned over 7%.

Why the 24% turnover among programmers? "Because that classification is where the most counteroffers are taking place," Butz explained. Programmers who quit one company for a new one often find their present employer matching or exceeding the new offer, Butz said. The choice is then up to the individual.

"We do not find many bidding wars going on, but we do see a lot of counteroffers," Butz observed.

Reasons for Turnover

Money, however, is only one explanation for the turnover rates. Butz cited four reasons why DPers in Indiana change jobs: lack of challenge; desire for professional growth; increased compensation; and advancement.

"Of all the reasons given for a job switch, challenge was ranked first or second most often," Butz said. "Talented, energetic data processing professionals look for challenge, volume, variety and complexity in their work. Many tell us that there are times when every project — and even crisis — looks the same."

Compensation was the most frequently ranked factor, but only 1% of the respondents placed earnings as their primary reason for changing jobs, the survey discovered.

"The higher up the DP ladder an individual climbs, the less that money was mentioned as a primary motivator," Butz said.

Advancement was the last reason cited for a job change. "Advancement does not necessarily mean promotion into management," Butz explained. "It can also refer to any step up the ladder within the DP department."

Women Earn 9% Less

INDIANAPOLIS — Female DPers in Indiana who had comparable experience and did the same work as men received 9% less salary than their male counterparts last year, according to a study of the DP work force in that state.

The pay discrepancy was uncovered by Computer Personnel Services, Inc., which examined the salary levels and work experience of male and female programmers, programmer/analysts, systems analysts and systems/software programmers.

The study compared the salaries of men and women with less than two years' experience and those with more than two years' experience. In each job category and at both levels of experience, women got the short end of the stick.

For example, a female programmer with less than two years' experience received an average salary of $12,009 vs. $13,465 for a male programmer, or 12% less. The gap barely narrowed after two years on the job, when a female programmer earned an average salary of $14,820 vs. $16,480 for a male programmer, or 11% less.

Even when average salaries for all levels of experience were figured, women programmers still lost. They received an average salary of $13,250 vs. $14,673 for men, or 10% less.

The pay differences between male and female programmer/analysts and systems analysts, while not as great as for programmers, were still "significant," CPS President Richard Butz said. "We used to believe that women usually started off head-to-head with men in terms of salary and then, because of career interruptions, dropped behind. Our figures show this is not true."

What the figures do show is that women start off at less pay and never catch up.

The average salaries for men and women should be equal if, in fact, companies are observing equal pay for equal work rules. But they aren't, Butz said.

"I cannot tell if a conscious or subconscious salary discrimination is taking place. I have no proof of that," he concluded. "But I do have proof that the dollars are different, significantly different. And they are different across the board."

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Separation of Bell's DP Constituents Urged

By Brad Schultz
CW Staff

WASHINGTON, D.C. — If AT&T can compete successfully with IBM in the DP marketplace, the giant holding company should divorce itself from its constituent DP-oriented firms, which should then merge as an independent and publicly owned DP vendor.

So said A.G.W. Biddle, president of the Computer & Communications Industry Association (CCIA), at a session of the Communication Networks '80 here recently.

But that's not how Bell sees the issue. Instead, the communications behemoth would like to continue owning Western Electric Co. and other subsidiaries that sell processing devices, according to Franklin T. Julian, Bell's director of Data Telecommunications Policies and Planning.

Biddle indicated that, under pressure from the federal government, AT&T should lose control of Western Electric and not be allowed to divert revenues from the voice side of its operations to subsidiaries that now compete with much smaller vendors of data communications products and services.

Contrasting View

In contrast, Julian maintained that the hybrid data communications industry can be competitive if Bell keeps control of its systems manufacturing arms under a scheme of "separate" accounting he compared to the financial relationship between AT&T's Long Lines division and other of its operating companies.

According to Biddle, 40% of the Bell System's revenues reflect costs arbitrarily imposed by the company's corps of accountants. Those costs are not, he said, derived from Bell's internal costs of producing and distributing what it sells.

Constituting a "pool" of billions of dollars, the 40% portion accrues from judgments on how to price the vendor's "Dataspeed 40 [terminal] . . . the Dimension PBX or . . . the phone they installed in your home last week," Biddle said.

"It doesn't take much of an error to wipe out a [firm] doing $500 million a year competing with AT&T," the CCIA president continued.

"It takes about one-half of 1% error in allocating those funds to determine whether they have grossly underpriced [their products] and driven a Data Transmission Co. [Datran] out of business," Biddle added. A common carrier that lay in ruins a few years ago, Datran still has a suit pending against AT&T that charges the latter with "predatory" anticompetitive practices.

Biddle called the antitrust laws that in principle forbid the actions attributed to AT&T by Datran "a paper tiger. . . . They will provide no protection except to mow the grass on the gravestones of those who chose to compete with an entrenched monopoly."

Long Lines Analogy

Julian's proposal that Bell's structuring of Long Lines serve as the model for loosening ties with Western Electric was criticized at the session by Walter Hinchman, former chief of the Federal Communications Commission's (FCC) Common Carrier Bureau.

"I don't know how familiar you are with Long Lines' degree of separation," Hinchman told session attendees, "but I'm not persuaded that's a very separate type of activity." The ex-regulator suggested that Bell may have to divest some of its holdings to satisfy recent FCC rulings.

Hinchman also took exception with a claim by Julian that efforts to deregulate the communications industry would violate the 1934 Communications Act.

Staying Out of Market

Despite Bell's federal troubles, which were exacerbated last year by the launching of an antitrust suit, the company does intend "to participate in the marketplace which many people are calling the 'information age,'" Julian said.

"We feel that we have in the past provided our users with a substantial array of products and services that they've been able to use to make their businesses more productive and efficient, to make their homes more communicative, to help themselves in whatever their businesses happen to be," the AT&T executive continued.

"At the same time, we do recognize the concerns others have expressed of the potential for cross-subsidization between . . . competitive and other types of services." Julian said that Bell has recently agreed "to nondiscriminatory access of underlying facilities" — FCC jargon for letting rival carriers transmit their services through Bell's basic telephone circuits.

Charges to Consumer

What about the criticism of his Long Lines analogy? According to Julian, Bell merely wants to avoid charging its telephone customers higher rates.

The scheme to sell DP products and services through a "resale" corporate division, rather than through loosely linked subsidiaries or spin-off companies, would entail less overhead for AT&T, he said.

More overhead, as a result of selling through distant satellite firms, would be passed on to the telephone consumer, the Bell spokesman hinted.

Nevertheless, Biddle reiterated his notion of a spin-off Bell organization that would compete in the computer industry's heartland without fear of FCC or Justice Department interference.

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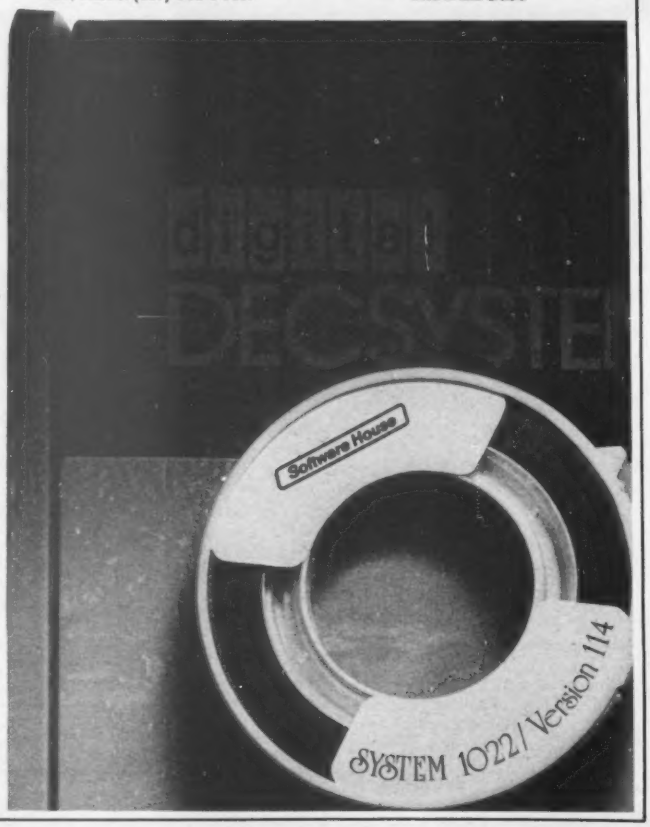


But Change in USPS Role Feared

Postmaster Sees Cooperation With EMS Firms

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — The U.S. Postal Service (USPS) is eager to cooperate with commercial suppliers of electronic message services (EMS), but Postmaster General William Bolger made it clear here recently that any cooperation between USPS and the suppliers must allow the Postal Service to exploit new technology and continue providing universal mail service.

Bolger told a session at Communication Networks '80 (CN '80) that "the bottom line . . . for the Postal Service is that if we do not harness this technology to make its benefits available to all of the people, we risk the very real danger of being overwhelmed by it.

"If we should ever be shackled to costly, archaic practices, the inescapable result would be inferior service, decreased productivity, declining volumes, higher rates, increased subsidiaries and staggering deficits," he said.

Major Change

Commercial suppliers, however, are concerned that the USPS' plan to offer the Electronic Computer-Originated Mail (Ecom) service and similar electronic services represents "a major change in the Postal Service's traditional role.

"It is the beginning of the agency's attempt to enter the communications marketplace," Stanford Weinstein, an attorney for Graphnet, Inc., said at the session.

Citing USPS figures, Weinstein predicted that two years after Ecom begins operation, USPS will be carrying as many messages as Western Union Telegraph Co. did in 1978. And, he added, the total Ecom market is expected to grow rapidly after its first two years.

Since the USPS pays no taxes and can borrow from the U.S. Treasury, it would have significant advantages over commercial EMS competitors, Weinstein contended.

Administrative Fiat

Furthermore, once the USPS began transmitting mail electronically, it could expand the Private Express Statutes to include such traffic, Weinstein suggested. The statutes basically grant USPS an exclusive monopoly to collect, transport and deliver "letters."

"Notwithstanding the [Federal Communications Commission's] efforts to adopt policies favoring competition in . . . electronic message services," Weinstein pointed out, "the Postal Service could attempt to apply the Private Express Statutes to those services to prevent others from offering them.

"Thus, by administrative fiat, USPS could reverse a long series of FCC decisions and eliminate the very competition the commission has sought to establish."

He added that the Postal Service's local mail distribution facilities, when combined with communications carriers' intercity network service, "can form an integral part of tomorrow's electronic message services. To accomplish this, the Postal Service should cooperate with, rather than compete with, private industry by offering nondiscriminatory interconnection with its hard-copy delivery facilities throughout the country."

Bolger expressed the same thought when he said the Postal Service "will structure its internal system to be compatible with, and accept input from, the broadest possible number and types of industry-provided computer, word processing, facsimile and related EDP devices now and in the future.

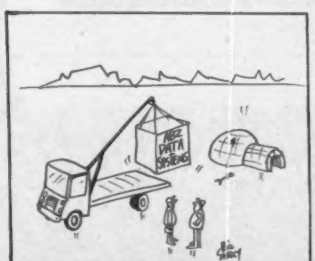
"Present and future electronic common carrier contractors will provide the electronic communications services to move mail from mailers' facilities to the Postal Service's electronically equipped stations," he said.

When asked why USPS and commercial EMS firms were still arguing, given this seeming unanimity, Bolger replied, "There are still some 'details' to work out."

Weinstein said he couldn't answer the question until the USPS governors decide whether to change Ecom along the lines recommended last December by the U.S. Postal Rate Commission.

Essentially, the rate commission wants Ecom messages transmitted from the sender's terminal to the destination post office by commercial carriers. The Postal Service would then convert the message to hard copy and deliver it by mail carrier.

By comparison, the original Ecom plan called for the Postal Service to market a "bundled" service consisting of transmission as well as conversion and delivery.



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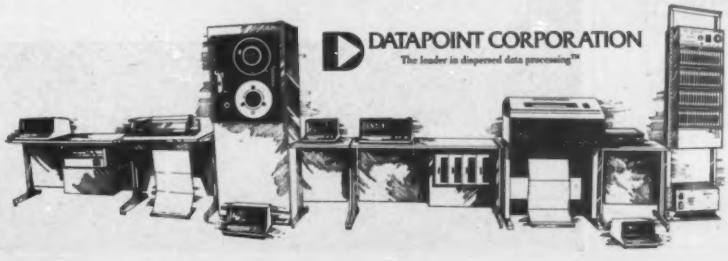

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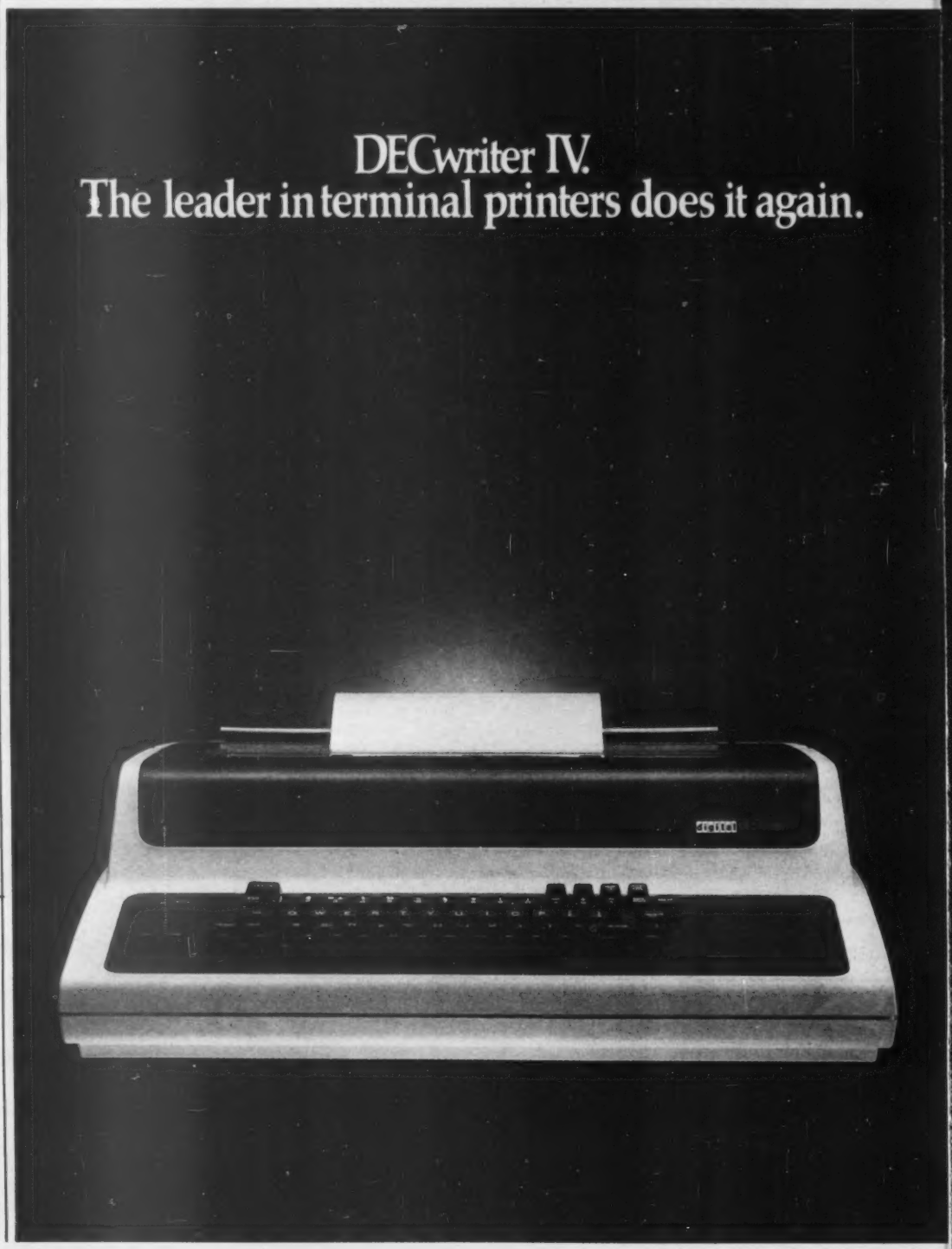

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March 10-12, Washington, D.C. — **Data Processing: Introduction to Concepts and Systems.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Also being held March 24-26 in Chicago.

March 10-12, Dallas — **DP Project Management: A Practical Approach.** Contact: Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

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Neighbors Negotiate End to Contract Dispute

By Jeffry Beeler
CW West Coast Bureau

SAN JOSE, Calif. — A local user's plea for help in resolving its longstanding system problems appears to have paid off.

The user's SOS reportedly has drawn a constructive response from the Santa Clara County Manufacturing Group (SCCMG), an association of 50 area firms representing the high-technology field and many other industries. The SCCMG's reply enabled the user, Santa Clara County, to begin resolving its bitter, six-month contract dispute with the supplier of its newly installed accounting system.

In essence, the group's intervention in the dispute laid the groundwork for the county and its supplier — American Management Systems, Inc. (AMS) — to negotiate a new contract that both sides hope will alleviate the major systems problems left unresolved in their installation agreement.

Specifically, the new contract contains provisions requiring AMS to boost the throughput of the user's accounting system by rearranging some of its jobstreams, according to Rick Witschonke, vice-president and general manager of the supplier's western region. The postimplementation support agreement also requires the contractor to modify the formats of some of the county's period-end financial reports and verify the reliability of several unimplemented subsystems.

Under the agreement, AMS will reportedly receive $160,000 for its enhancements and improvements, which are scheduled to be completed during the next four to six months.

Terms for the new contract were decided on Jan. 15 by members of a joint negotiating committee composed of AMS, county and SCCMG representatives. The agreement then went to the county's Board of Supervisors, where it was formally approved on Jan. 29, according to board member Dominic Cortese.

Six-Month Dispute

The adoption of the postimplementation support agreement marks the possible end of a running contract dispute that began last July 1, when the county installed AMS' Comprehensive Budget and Management Information System (CBMIS), large-scale accounting software package.

In theory, CBMIS was supposed to provide each of the county's user departments with unprecedented control over their financial information by centralizing all their accounting files in dual 2.5M-byte IBM 370/158s. In practice, however, the $1.3 million system proved monumentally difficult for the user to install and operate [CW, Nov. 19].

Training and documentation at times were said to be woefully inadequate. Downtime averaged about 20%, and shortages of disk file space threw the county at least a month behind schedule in producing period-end financial and management reports.

By late October, the county's DP capability had fallen into such disrepair that some local government officials were clamoring for CBMIS's removal and for a return to the county's former budgeting system, known as the Accounting Resource Management System. A few officials here even threatened AMS with a lawsuit for nonfulfillment of contract.

But today — with the user-vendor dispute apparently waning, thanks partly to the SCCMG's role in negotiating a postimplementation support contract — the chances the county will abandon CBMIS or make good on its lawsuit threat are practically nil, Witschonke said.

The SCCMG's involvement in the CBMIS contract dispute began after county officials contacted several local computer-oriented organizations for advice on how to resolve their new accounting system's ongoing problems. The group answered the county's appeal for help by bringing together representatives from all the interested parties in an all-day negotiating session.

Based on their analysis, the conferees advised the county to keep CBMIS, despite its performance flaws, and continue negotiating with AMS to resolve any lingering disputes.

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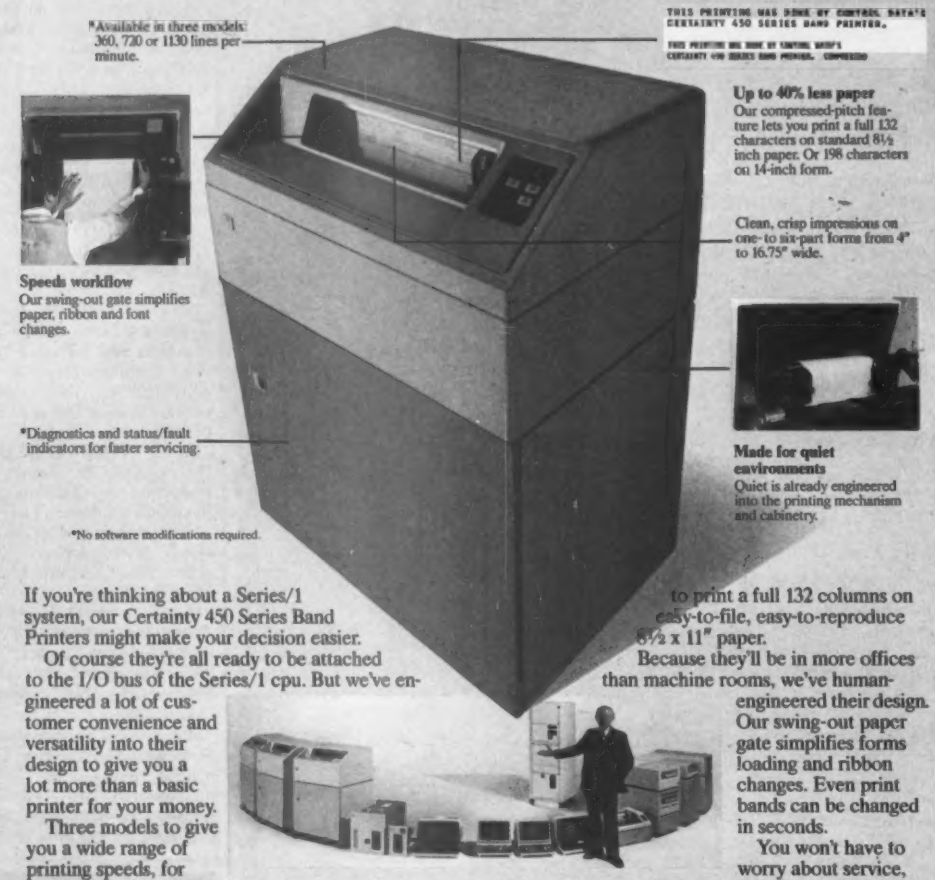
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Placement Firm Gives DPer Chance to Try Job

LOS ANGELES — Some DP managers might contend that the perfect employee is the one who is around when he is needed and disappears once the job is done. Contract Personnel Services (CPS) here claims to offer just such employees.

Dubbing itself a "Kelly Girl with refinements," CPS provides clients in southern California with one or more of its own paid staff members to work on short-term DP projects. This gives the employer the chance to evaluate an employee without having to decide on a salary or position.

It also gives the DPer the chance to decide if the environment is one in which he wants to continue working permanently, if asked.

"We are a marriage between an employment agency and a contract services company," Al Strong, CPS president, stated. "We bring people to a client like an employment agency, but we follow through. We don't want the company to decide on someone based on one interview — it might be making a mistake."

In an industry that is spending a reported $11 billion per year on employee turnover costs and that has an annual 30% to 35% turnover rate on company staffs in many major cities, Strong saw the need for an alternative to typical hiring practices.

Realizing that both the employer and prospective employee need time to decide if the situation is right for them, a year and a half ago Strong founded CPS, which currently sports 40 members on its staff. Most are Cobol programmer/analysts or have data base or assembly language experience.

Mutual Benefits

The idea behind CPS is to provide benefits to both the DPer and the employer, according to Strong. An employer can use a qualified person to complete a specified project. After evaluating that person's performance, the employer can decide whether to hire him on a permenant basis.

This also gives the DPer time to decide if he wants to stay there permenantly or remain with CPS and accept a different assignment.

Members of the CPS staff are paid a regular salary by CPS whether or not they are currently working. They also receive paid vacations, holidays, health insurance, profit sharing and other benefits.

CPS pays slightly below standard wages according to a spokesman, but the employee can make this up by participating in CPS' bonus plan, which encourages employees to work a certain number of hours and complete projects for cash bonuses.

CPS charges the client employer an hourly fee of approximately $1 per $1,000 of the employee's salary and also charges a commission when one of its employees is hired by the client. In the last year and a half, 60% of the CPS staff was offered jobs by clients, of that number, 75% accepted the positions.

A client can hire a CPS programmer usually after six months. Strong believes that as more jobs are filled satisfactorily by CPS staffers, satisfied employers will keep returning to CPS for repeat business.

With the CPS concept, "there is a minimum of risk for both programmers and employers. People like that," Strong said.

Courses to Teach Basics of DP To Non-DPers

SPRINGFIELD, Va. — Management Resources International, Inc. is offering two courses next month in Washington, D.C., to acquaint managers, secretaries and other businesspeople with DP concepts and the basics of a computer's operation.

The first course, "Data Processing for Secretaries and Administrative Support Personnel," will be held March 10-11 and cover everything from automated office equipment to data security, a spokesman said. Stressing an understanding rather than an in-depth knowledge of computing, the seminar will focus on computer equipment and terms, remote computing, programming languages, system design and controls and a discussion of the positions available in the DP field.

The second class, a three-day affair March 17-19, will probe deeper into DP technology and computer systems. "DP for Managers and Professionals" will also cover the computer basics but, in addition, will target CPU concepts, systems development, program debugging, computer networking and data communications, the spokesman said.

Both courses are presently being offered on a two-for-one tuition special. For instance, the registration fees for the first seminar are $250 for one or two participants and $500 for three or four attendees. The fees for the second course are $400 for one or two people and $800 for up to four participants.

Additional details on the classes can be obtained from the firm at 6621 Electronic Drive, Springfield, Va. 22151.

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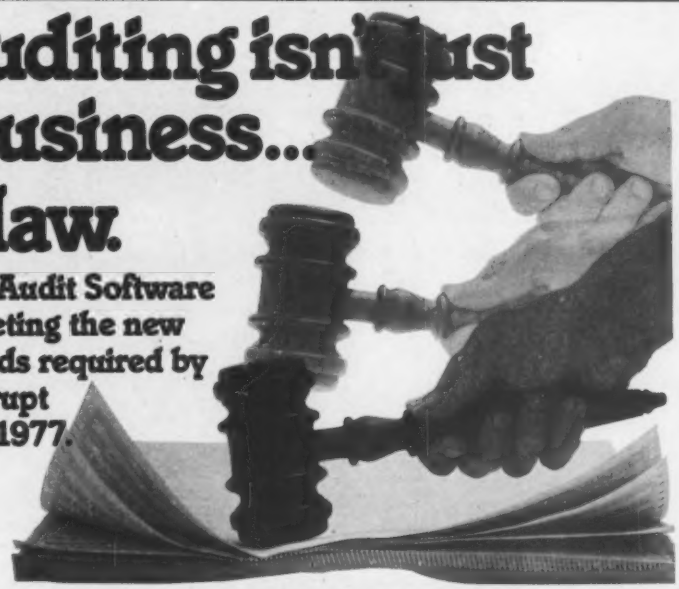

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25 Pittsburgh, PA
26 Syracuse, NY
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10 Jacksonville, FL
10 Los Angeles, CA
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The Plus 80 offers everything IBM has to offer and a few extras. Like a switch that allows the program pad to act as a 10-key adding machine. Internally stored diagnostics are built in for both user and Trivex Field Service fault isolation.

Diagnostic routines have been greatly simplified for the operator. The unit is designed to test the functions of the display at power-up, before automatically switching to on-line mode.

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Feedbowl Jawboning Cuts Eating Time

Technology Brings Fast Food Operation to Cows

URBANA, Ill. — Using a minicomputer as a cowhand may sound like an unusual application, but scientists here at the U.S. Department of Agriculture's (USDA) Science and Education Administration are milking the idea for all it's worth.

The scientists have developed a computerized method of feeding cows faster and more cheaply with a new kind of feeding bowl that tells the cow when she's had enough. The USDA is also working on a project, using the same basic technology, to monitor a cow's temperature and tell a farmer when one of his cows is sick.

Agricultural engineers along with dairy scientists developed the computerized feeding bowl with an eye to making a fast food station for cows.

With the current system, a single stall now serves about 40 cows a day; it formerly served only 30, according to the USDA's Hoyle B. Puckett.

"We found a cow spends less time dawdling and eats her cereal grains and supplement faster if her bowl has a shape similar to her lower jawbone instead of [the typical] hemispherical shape," Puckett said.

Eating More, Faster

The new bowl, coupled with an electronic identification system, seems to be working. Cows now consume an average of 5.9 ounces of feed per minute. With the traditional bowls, they eat 7.9 ounces per minute, Puckett said.

Each cow is fitted with an Identronix, Corp. transponder. The transponder is attached to the cow's collar so that when she sticks her head into the feeding bowl, she activates the feeding unit and it slowly dispenses food.

When the transponder's coded memory is fully charged, the dispenser stops. As time goes by, usually in about 12 hours, the transponder's electronic charge dies off and the cow is again allowed to eat, Puckett said.

The minicomputer — a Data General Corp. Nova 3 — comes in handy in determining exactly how much feed a given cow should get. The system is designed to feed a cow proportionally to the amount of milk she produces.

Temperature Sensing

The feeding system can be expanded to perform other functions as well. By implanting a small sensor under a cow's skin, the same transponder, developed by scientists at the University of California working at the U.S. Department of Energy's Los Alamos Scientific Laboratory in New Mexico, can be used to monitor cows' temperatures and tell the farmer if one of his cows has a problem.

"We hope the monitoring system can be used to help dairy farmers direct their attention to cows needing special management attention before serious problems develop," Puckett said.

The temperature monitoring system, which also ties into the 10M-byte Nova 3, is just starting. Scientists are now working on implanting a herd of cows with the sensor.

The research on electronic identification and temperature sensing uses the DG mini to mathematically define sets of conditions, or norms, in the dairy herd that can be associated with high productivity. Each cow can be treated as an individual with the monitoring system because its own norm can be determined, according to Puckett.

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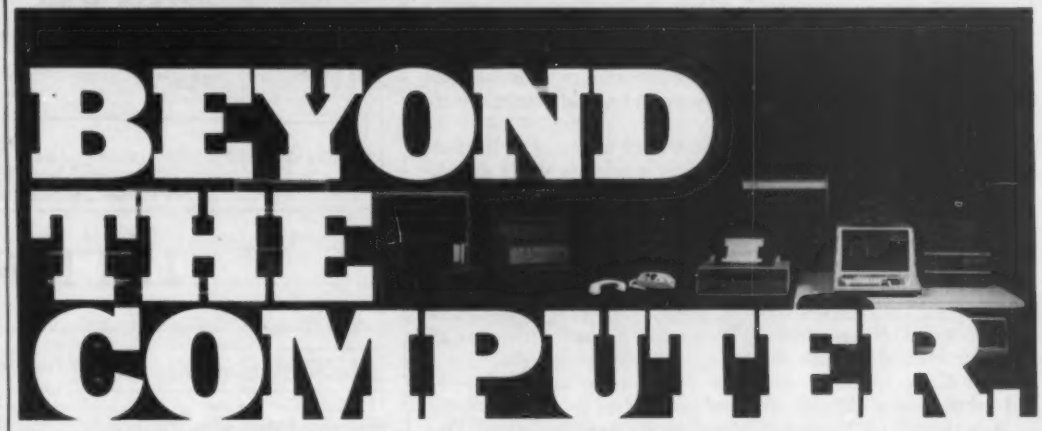

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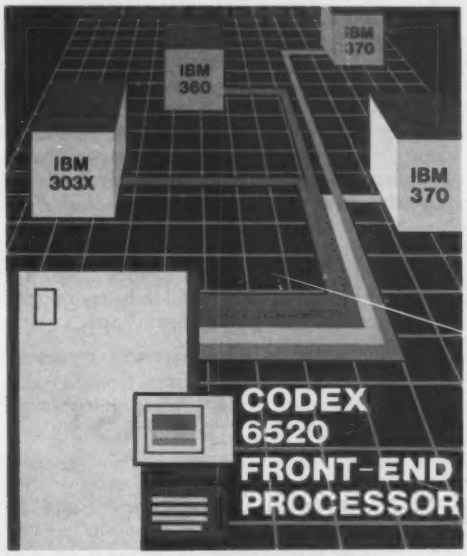

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EDITORIAL

Federal DP Reform

The annual delivery of the federal budget to Congress seems a good occasion to reflect on the status of federal DP — how it may or may not facilitate the objectives of government and how it affects the private sector and individual citizens.

The fiscal 1981 budget President Carter recently submitted to Congress includes a proposal for $5.301 billion in DP expenditures [CW, Feb. 4]. The budget represents a climb of roughly 9% in both total federal spending and allocations to computing alone.

The proportion of federal expenditures reserved for the DP activities of government agencies remains about the same as it was last year — roughly 1%. However, the President wants a 12% increase in subsidies for basic scientific research and a 13% boost in funds for more applied research and development. Those increases would affect progress in both theoretical and applied computer technology and would eventually affect the DP user.

The budget does not call for significant increases in the federal DP work force, but the plan to accelerate R&D may to some extent relieve the personnel shortage in academic computer science and stimulate private-sector efforts to advance the state of the art in DP.

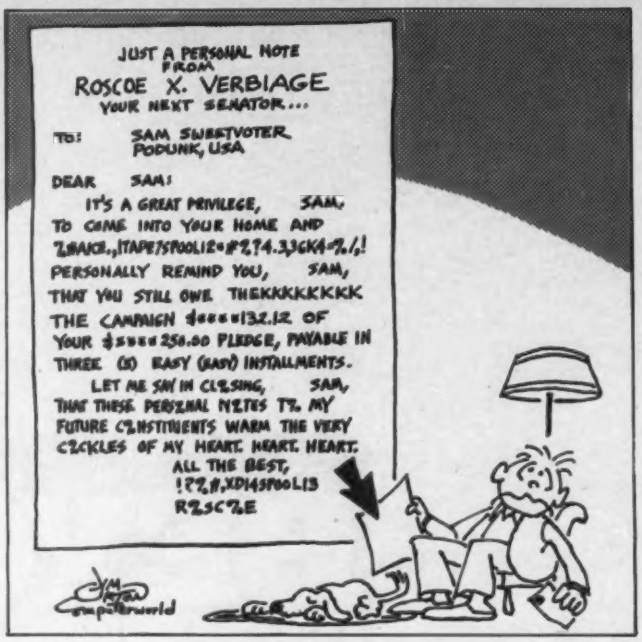
Much R&D in computing cannot be done in the public sector, which lacks sufficient resources and personnel for such activities. Instead, the bulk of significant work in computer science and DP has generally been accomplished at universities and industrial research centers.

The Carter Administration has begun a much-needed overhaul of federal DP activities and policy, but there seems to be little chance for sweeping reform in the next few years. Deplorable procurement practices that became entrenched over the last three decades are to blame for the obsolescence and inappropriate implementation of federal DP facilities costing billions of dollars.

It is commendable that the Office of Management and Budget (OMB) and the General Services Administration are trying to cut procurement red tape and effect more efficient procedures for matching federal user needs with adequate resources. But the dimensions of a true reform are staggering in terms of what is required from government managers and public funds.

According to OMB, the average age of federal computers is now seven years, compared with 7.3 years at the end of fiscal 1979. Federal installations therefore lag well behind those serving many large corporations.

Reform efforts should continue full steam, but until federal DP is truly rehabilitated, Congress should ensure that R&D for government computing applications is contracted to responsible workers in academia and industry rather than left to stagnate in mismanaged government shops.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YOUR $ 250.00 PLEDGE, PAYABLE IN
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LET ME SAY IN CLOSING, SAM,
THAT THESE PERSONAL NOTES TO MY
FUTURE CONSTITUENTS WARM THE VERY
COCKLES OF MY HEART. HEART. HEART.
ALL THE BEST,
R2D2C3PO

LETTERS

Module Misunderstanding

I would like to clear up a potential misunderstanding about the process involved in fetching a load module in an IBM OS or OS/VS system. The article "Anatomy of a Load Module" by Robert Shullich [CW, Jan. 21] stated: "These IDR records cost the on-line system three extra I/Os per load."

Although the specific on-line software is not mentioned, most systems use the normal IBM OS program fetch software. The OS routines which are invoked to fetch a load module into storage do not usually require that the ESD, IDR or SYM records be processed. All of these documentation records are placed before the first text record of the load module.

The directory entry for the load module contains a TTR pointer to the first text record of the load module and the length of this record. A bit is also provided to indicate that the load module consists of only one text record and no RLD record, in which case the load module may be fetched by reading only one record. Otherwise, two reads per text record are required.

As Shullich pointed out, the ESD and IDR records provide useful documentation, and are certainly worth the extra disk space which they require in this era of inexpensive disk storage.

Donald L. Ebright
Southfield, Mich.

Management of Complexity

"Surveying the '70s as we enter the '80s," the Dec. 31/Jan. 7 issue, was a brave journalistic venture, more so for the contributors than for *Computerworld* itself.

The article "1990: A Vision of the Future" tackled the situation courageously in neck-sticking-out terms, but also responsibly. "Ethnotronics" will become established with certainty in our buzzword dictionary. It is in this area that I think the vision falters. It fails to grapple with the coming clash between the empirical science of techno-engineering and the art of management.

I am less concerned by the timorous who shy away from our ethnotronic future and more concerned by go-go entrepreneurial establishments which fail to understand that wholesale purchase of cheap complexity carries with it the responsibility to manage that complexity.

I believe this will demand research into organization structure and design such as we have never carried out before. It then may be discovered that more organizations survive through human adaptability than fail through inadequate management.

The management of complexity is the challenge of the '80s. On its success or failure depends our vision of the '90s.

W. J. Talbot
Adlington, England

Rationing Proposal

I agree with Herbert Martenson's proposal for gas rationing [CW, Jan. 14]. I think it is a logical 1980s approach to our fuel shortage problem.

I find, however, one problem with the system: A family with one car but three licensed drivers would be allocated three times as much gas as the similar family with only one driver.

Perhaps, the "FAC" cards could be issued based on car registration rather than per licensed driver.

K. Shantz
Columbia Station, Ohio

Computerworld welcomes comments from its readers. Preference will be given to typed, double-spaced letters of 150 words or less. *Computerworld* reserves the right to edit letters for purposes of clarity and brevity. Letters should be addressed to Editor, *Computerworld*, 375 Cochituate Road, Rt. 30, Framingham, Mass. 01701.

DATA PAST

Five Years Ago
Feb. 5, 1975

DENVER — In a wide-ranging ruling that absolved IBM from monopoly charges, the 10th Circuit Court of Appeals here reversed the $259.5 million awarded to Telex Corp. in its suit against IBM. In making the finding, the appeals court said that Judge A. Sherman Christensen, who made the original award to Telex, erred in his definition of the market and that IBM practices were competitive, not predatory. At the same time, the appeals court essentially upheld the lower court's finding that Telex "misappropriated and pirated" IBM trade secrets, but reduced the amount of damages from the original $21.9 million to $17.5 million.

Eight Years Ago
Feb. 2, 1972

NEW YORK — NCR Corp. and Control Data Corp. announced a joint venture, including the establishment of a joint peripherals manufacturing company and plans for the design of a full range of compatible mainframes. The "cooperative effort for the development of future central processing units" would give the firms the "economies of scale" needed to compete effectively and serve present and future users, the companies said.

AND IN THIS CORNER Kenniston W. Lord Jr.

Walk a Mile In Controllers' Shoes

If one were to seriously believe C.N. Winningstad's assessment of the Federal Aviation Administration (FAA) imbroglio, the next logical step to his reasoning would be to bring all FAA air traffic controllers before the law on charges of gross malingering. His conclusion that this mess is the by-product of a desire for wage parity on the part of the controllers begs the basic premise that they have been asked to do a complicated task under extreme pressure with tools that have been proved to be faulty. Before you make such an assessment, Mr. Winningstad, I would sincerely suggest that you "walk a mile in their shoes."

I, too, am a pilot of considerable hours, rating and training. If you, as a private pilot, instrument-rated, could transition to a 747 in 20 hours, you are indeed a superman, for even the most inexperienced aeronautical ninny knows that that amount of training is insufficient to get rated, much less insured. Your simile was a poor effort at verbal grandstanding, sir. As pilots, we both know about backup systems, that's true. We also know, and you carefully omitted, that the aircraft we fly are extremely forgiving of our mistakes, are operated within a margin of safety that does not evaporate in seconds and at worst risks lives in small numbers.

The controller, whatever his motivation to advance, obtain better financial status or learn more complicated tasks, is nonetheless working within a pressure cooker. Within that pressure cooker there isn't time to trim the tabs, feather the props, select a glideslope or do any of the multitude of little adjustments both you and I *know* we have time to do. For the controller, now it's there and now it's gone.

And then comes the requirement to "instantaneously" move a 400-lb object, reorient himself and begin again.

(Continued on Page 32)

READER COMMENTARY Lane K. Anderson

Handling Systems Teams: Case of Make or Break

Kevin threw open the office door, stomped to the front of the desk and stood defiantly. His muscles tensed like a cougar ready to spring for the kill. His jaw clenched and looking down at me, he cursed, "I quit!"

"Why?" I asked, hoping to quiet him and avoid being punched in the process.

"That — — project leader tells me I don't contribute. I work hard. No one appreciates my effort," Kevin reached the door in two quick steps and disappeared down the hall.

This young man was one of five people on a consulting team formed to design an information system for an educational foundation. The project failed miserably. Kevin and his teammates blamed the leader and each other. The team leader accused the others for lack of cooperation. The division was never bridged. The systems design never got off the ground.

As systems analysts, we consider the human element in the systems we analyze and design. How often do we forget the human element in the team overseeing the phases of a system's life cycle? The interaction of team members can make or break the desired results.

Ingredients for Failure

What factors led to this team's failure? As the one in charge of the engagement, I failed to match team members' skills with the leader. The team leader had a great deal of experience in the type of systems this client needed, but he had never supervised more than one person at a time. Team members were entry-level people. They had little experience either in technical aspects of the system or in working as a team. Here was the beginning of a volatile situation.

The team leader was a "do-it-yourself" type. He gave little instruction with assignments. When team members' work came in for review, he said it wasn't what he wanted. He refused both to explain why and to have them redo the work under his supervision. Instead, he did the work himself, at least the creative part of it, even though it required a sacrifice of his own time.

He gave his work to team members with assignments to complete the clerical portions — the paper-shuffling part. He criticized them openly for not contributing to the project and declared they lacked intelligence. As would be expected, the team missed every project deadline.

This team leader failed to follow one important leadership principle. When delegating responsibility, the leader should look for results. He shouldn't expect others to do the work the same way he would. He must emphasize, instead, that the results needed are the results that must be attained. The old saw is still true: "There is more than one way to skin a cat."

Team members were also at fault. Accused of being incompetent and unintelligent, they reacted. They refused to work, to cooperate and to do anything furthering the project. Their attitude was simple: If the team leader does not like our work and does it himself, let him do everything. Each member wanted involvement in the creative process, and they found working only on menial tasks insulting.

As systems analysts, we consider the human element in the systems we analyze and design. How often do we forget the human element in the team overseeing the phases of a system's life cycle?

I called the team to my office. We hashed out the differences. Each one recognized his role in the failure of the project. Each one promised to change and to complete the required work. They seemed willing, but the wounds were deep. Team members continued to accuse the leader of doing all the work and not allowing them to contribute. They also criticized each other for not carrying their fair share of work. The leader continued his assault on their contributions and intelligence. No wonder the project failed.

Positive Side

Moving from the negative to the positive side, let's look at another team. This one was developing an information system for a manufacturing company. The team leader had experience on a number of systems engagements. She had supervised people before. Team members were cooperative, intelligent and had some experience. Their work indicated ability.

The team leader was unable to make a decision regarding the direction of the project, for which there were two alternatives. The leader favored one, feeling it would create less of a political disturbance within the company. Team members wanted the second, because it better met the information needs of the company. A stalemate resulted and the team began to disintegrate as a working unit.

One team member, a young woman, came to me to express her concern. She like this project and wanted it to succeed. She asked if I would help pull the team together. So I gathered the group, and we discussed the pros and cons.

Indeed, the team leader could not make a decision. Everyone wanted the project to succeed; they would work together towards that aim. As a result, the decision became a team effort, and a solution was reached. Once the group agreed on direction, they outlined the steps for accomplishing the work. I expressed confidence in their ability to accomplish their plans. The team leader supervised, and the team did a fine job.

"People make the difference" is a worn cliche. Yet people, treated in the right way and with a desire to do a good job, can dramatically affect project results.

Anderson is an associate professor of business administration at Texas Tech University in Lubbock.

READER COMMENTARY/R.E. Kukrall

Guarding the Guards

"Sed quis custodiet ipsos custodes?" But who is to guard the guards themselves? The question posed by Plato more than 2,300 years ago has some contemporary merit. Who watches the watchers, or in the contemporary sense, who audits the auditors? P.J. Corum of Pansophic Systems claims "the next major computer crime will be committed by a DPer who will cover his tracks by manipulating processing requests made by the DP auditor." This obviously could happen or has happened and has not yet been discovered.

The possible crime posited by Corum is problematic, but an extension of his surmise is interesting. What of the *auditor* who commits fraud or defalcation while operating within the functions and scope of assigned job responsibility? Webster defines defalcation as "the act or an instance of embezzling or a failure to meet a promise or an expectation."

It is not the purpose of this commentary to case aspersions or make insinuations against a very honorable profession, but rather to hypothesize.

Auditors classically function in an autonomous, independent mode. Add to that the expansion in the use and capabilities of generalized audit software packages. Throw in an ever-increasing knowledge of the technical aspects of the business coupled with the fact that the auditor is seldom "audited" and you may have created a climate conducive to nefarious activity.

If we assume for a moment that the hypothetical possibility of auditor manipulation of data, hardware or software does exist, what can be done to forestall or discover it? I suggest the following:

- Division of responsibility among/between auditors.
- Separation of duties and functions.
- Review of work performed by responsible audit management.
- "Team" approach rather than individual.
- Potential use of surveillance and monitoring systems, particularly if generalized audit software packages are heavily used.
- Continuous joint education programs in audit, security and controls for the applicable functions of DP, users and auditors.

One does not, and should not, expect auditors to commit or be involved in fraud or defalcation, but considering the statistical probabilities alone, there may be cause for concern.

Kukrall is manager of Information Systems Security and Auditing with the Technology Analysis Group, Advanced Computer Techniques Corp., Phoenix, Ariz.

READER COMMENTARY/Robert H. Shullich

Death of a Programmer

In many small DP shops, programmers are facing an intellectual death. Progress seems at a standstill or the situation even regresses as hardware and software in the small shop remain stagnant. The major cause of the intellectual death is the lack of sufficient training.

The DP industry is in its early years. All around us are pieces of an industry. It will be many more years before the pieces fit together. Right now there is widespread ignorance of the DP field and its operations in the ranks of upper management. Many managers do not understand the fast growth and changes in DP.

The misconception is that all things need only be done once. Some managers and users unfamiliar with DP do not consider keeping up with the times because they don't know the times are changing. And sometimes they expect too much from a relatively unstable field. Stabilization will come when the field is standardized in hardware and software.

To illustrate a shop in slow progression, or even going backwards, let's look at a small former IBM 1401 shop. Two years ago, this shop converted to a small IBM 360. The programmers were given some training in DOS and Cobol. All the programs in the shop were 1401 autocoder or SPS coded. Today the shop has a mixture of 1401 and 360 programs. All the old 1401 programs are run under 1401 emulation using the 1401 compatibility feature of the 360.

Some programmers are still coding 1401 autocoder to run under 1401 emulation for quick and dirty programs. Something is definitely wrong. Even if programs like RPG or Mark-IV were available, would they have been any use? Many programmers will pick a language or utility to perform a function based on how well they know or can work with that utility. Unless they know a variety of languages and utilities, the language or software package most appropiate for an application may be passed over. This could result in extra development and machine costs. An important step is to make more software packages available, but the software is of no use unless proper training is made available for the programmers to use these products.

Training for Management

As training and education remain deficient at the user and upper management levels, so it will remain almost nonexistent in DP shops. It is necessary to train and educate upper management in the needs of the DP shop, including why training and the purchase of new software packages are needed.

If a shop, small or large, does not allow its programmers to grow in knowledge and experience, they will become as obsolete as the software and machinery on which they are working.

DP professionals must also make an effort. They must keep up with progress in computing, regardless of whether their companies supply proper DP training. Seminars and DP courses offered by colleges and software companies can aid in programmer growth.

The cost of this training should be picked up by the company, since the company should contribute to the employee's career growth. If a company does nothing to aid in career development through training, its employees will probably find another company that will. This applies to all professions. This lack of proper training and career achievement is one of the most common reasons for high turnover in small shops.

Who Should Pay

Some small shops are part of large companies that have many small decentralized computer centers. Some of these large companies decide to centralize their computing facilities and either eliminate all the smaller shops or convert them into remote job entry sites. Programmers at these sites usually consider a centralization objective as "the handwriting on the wall." Even though the programmers probably wouldn't get fired, the small DP center would be allowed to die slowly as the DP budget is cut and the DP staff dwindles through attrition. Programmers in the small shop would fight the centralization move if it would jeopardize their jobs.

But if the inevitable is conversion to a centralized system, then fighting the conversion. or even leaving the company beforehand, could hurt a programmers's career. By getting involved in the conversion, programmers and analysts can gain experience and training in the new and larger system. While they may be seen as contributing to the loss of their jobs, by this time they have already given up. And in the end, the conversion experience and exposure to the new, more advanced system can guarantee them a future somewhere else.

Shullich is a consultant for Informatics, Inc.'s Professional Services Division.

SOCIOLOGY OF COMPUTING/Robert L. Glass

Flat Earths and Flowcharts

Sometimes technical fields get stuck in erroneous positions and seem totally unable to extricate themselves.

I think of it as the Flat Earth Syndrome. Was astronomy any less a science for accepting the notion of a flat earth before it was proven wrong?

Have you wondered how many false beliefs we've fostered in computer science? I mean, every science has its flat earths, right? So what are ours? Believing in them doesn't make us any less scientists; it just makes us erstwhile ignorant scientists.

The point is this: Computer science has already discovered one Flat Earth in its midst. One, for a time, right at the heart of the field. I am talking about the value of the flowchart.

I still remember when the flowchart fell from grace. It's not hard to remember, because what happened at General MPG Motor Co. when it did was like no other event I've witnessed.

Innocent Beginnings

You have to understand the history of the flowchart in order to understand the violence that followed in the wake of its fall. It all started innocently enough. I can remember drawing boxes and words and lines and arrowheads as early as the '50s. In fact, most programmers can remember being helped by them. When their pencils crept more slowly on the coding sheet, they always knew they had reached a level of design that was still incomplete. Then, and (except for overview graphics) often only then, they would draw those pictorial spider-wheel pictures that helped elaborate their design and restore their progress.

Something perverted the use of the flowchart after that. Management, seeing that programmers got something out of flowcharts and knowing that system internals documentation was important, superimposed the flowchart as a solution over documentation as a problem. Suddenly, a requirement sprang into life that every stick of code be flowcharted. And hardly anyone distinguished between the flowchart as a design aid and the flowchart as documentation.

This went on for a decade. A few innovative thinkers toyed with other design representation assists and other documentation aids, but for the most part, flowcharts were as pervasive as coding sheets in the halls of Digitsville. They even, in fact, developed the Flowchart Template.

Now the Flowchart Template, as you well know, was a cookie cutter approach to graphics. As the level of the flowcharting pseudoscience grew more sophisticated, there came to pass a standardization not just on the requirement for flowcharting, but on the shapes of the components of the chart. And the template was the physical embodiment of those shapes.

There had been rumblings of discontent before "Study on the Value of the Flowchart" was published in *Computer Trends*, of course. Some people were proposing design languages as a replacement for the flowchart as a design aid, and perhaps even as documentation. The reasons seemed pretty compelling. But inertia kept the flowchart, like Fortran and Cobol after the development of PL/I, in constant use.

The study, however, could not be ignored. The sample was small but the conclusion inescapable. In a well-designed experiment to study the value of the flowchart in both its roles, the value was found to be nil. Perhaps even negative. The flowchart, I have to reiterate, was valueless!

Explosion of Resentment

Two decades of resentment of the flowchart exploded after that.

It started innocently enough at General MPG. Reprints of the *Computer Trends* article were posted anonymously on the bulletin boards. Soon, gratuitous grafitti filled the margins of the article, most of it humorous but some of it biting.

What happened next startled everyone. The focus of resentment became the flowchart template. Someone suggested burning the templates. You have to realize here that even though the flat earth of flowcharting had been proclaimed in a responsible technical journal, the standards documents of General MPG still called for its use. And programmers caught in that dilemma were marching to a "Freedom Now" beat. Burning the templates seemed, in the hysteria of the time, to be an effective way of serving notice to management that the standard would no longer be tolerated.

When all of the voluntarily donated templates were piled in the center of the keypunch room floor, it made a fairly unimpressive heap. The rowdier members of the increasingly unruly crowd came up with the notion of "total eradication" of the template! After hurried discussion, one group ran out to the programmers' work area, ransacking desks looking for forgotten templates, and another forced its way into the supply counter, bringing back whole cartons full of templates.

After the return of the raiding par-

(Continued on Page 30)

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LETTERS

Algorithm Extended

The Reader Commentary by Bhairav Joshi [CW, Jan. 14] has prompted me to write this letter. There are a number of very simple algorithms for determining the day of the week. Perhaps the most elegant one is by Gruenberger and Jaffray (*Problems for Computer Solution*, Wiley 1965). As published, this algorithm is only valid until Feb. 28, 4000. I have taken the liberty of extending it to deal with the Gregorian calendar as described by Joshi.

Because leap year days fall between the end of a "normal" 28-day February and the beginning of March, the ordinals of the months must be rearranged. March must become the first month, April the second and so on. January and February must be considered as months 11 and 12, respectively, of the prior year. The residue, modulo 7, of the following expression will yield the day of the week (with Sunday corresponding to 0, Monday to 1, Tuesday to 2 . . .):

$$[2.6m - 0.2] + d + y \mod 100 + [y/400] + [(y \mod 100)/4] - [y/4000] - 2[y/100]$$

where m is the adjusted month ordinal, d is the day of the month and y is the year (suitably adjusted if the month is either January or February).

To illustrate how this algorithm works, an example will be worked out. Substituting 12 for m, 16 for d and 5729 for y in the expression, Feb. 16, 5730 falls on:

$$(31 + 16 + 29 + 14 + 7 - 1 - 114) \mod 7 = -18 \mod 7 = 3$$ a Wednesday.

Because it requires no reference date against which it must be compared and for its elegant simplicity, this algorithm is preferable to any of the others Fortuitously, the number of days in the 400-year subcycle is a multiple of 7. This suggests that dates should be represented as an index set of integers; in which case, simply dividing the date's representation by 7 would yield the day of the week.

This concept would yield the correct result until the year 4000. I have implemented the necessary encoding and decoding routines for a number of different CPUs.

Incidentally, the mean length of the year described by Joshi should be 365.24225 days and not 365.2425 days as stated. (Astronomically, the tropical year is actually 365.242199 mean solar days long. Let us hope that some calendar reform is undertaken before this becomes a serious problem!)

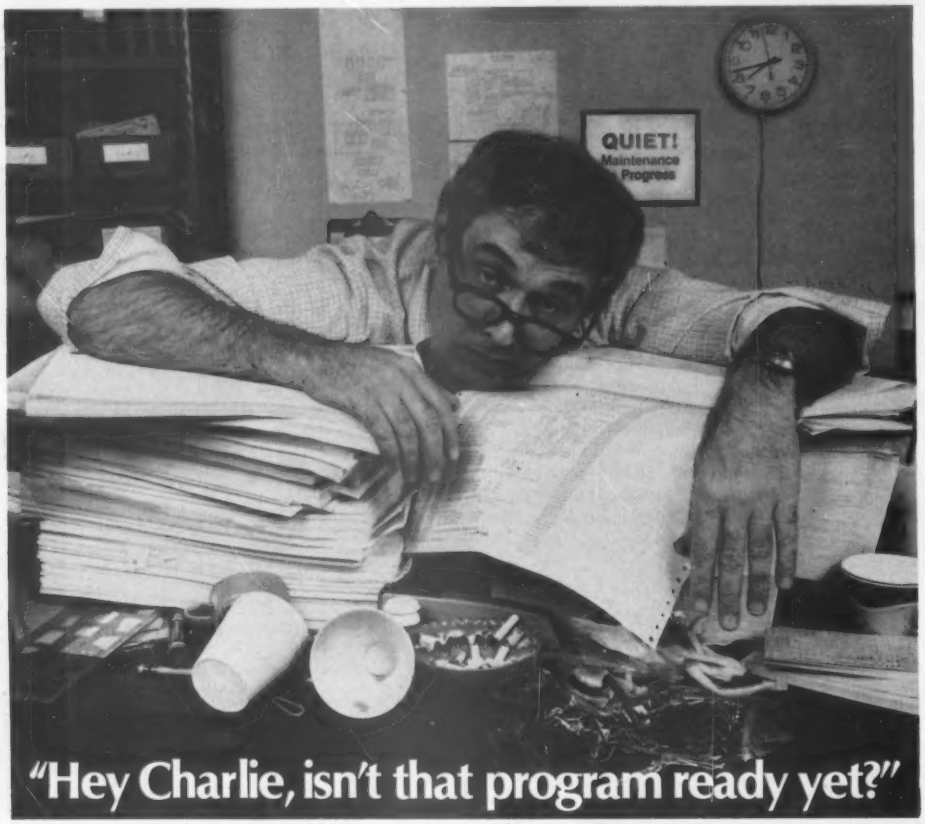
Henry Beitz
Arden Hills, Minn.

Cartoon Too Negative

I object to the tone of the cartoon that appeared on Page 7 of the Dec. 31/Jan. 7 issue of *Computerworld*. Humans do not require a cattle prod as work incentive. My own staff has been and continues to be professional in all respects. And whether they work in a computer room or report to me directly, they are sensitive people who outside of work essentially perform the same tasks regardless of their title — that is, raise families, decide to buy a car or home, work in their communities.

Certainly your space could be used in a more positive fashion.

Theodore Tomaszewicz
New York, N.Y.



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Flat Earths In Computing

(Continued from Page 29)

ties, the heap became significantly larger. And that might have been the end of the uproar, if some near-hysteric nut, carried away with his power in the supply counter raid, hadn't touched a match to the whole heap. And suddenly, the hysteria was drenched in fear.

Flowchart templates don't exactly burn. They kind of melt, and they give off a great deal of smoke. And this fact was soon discovered by the General MPG keypunch room smoke detectors. Their shrill sound keyed the already desperate fear to a fever pitch.

It was while a few cooler heads were running back with fire extinguishers that the overhead sprinkler system went off. It took only a few moments for the fire, the crowd and the fear to be totally subdued by the pervasive downpour. The smoke still poured from the smoldering melted heap, looking like a caricature of modern sculpture done in plastics, there in the middle of the blackened floor. But the people, soggy from collars to shoe bottoms, slowly and morosely filed from the room.

To speak of disciplinary and corrective action is relatively pointless. It happened, of course. A few ringleader heads rolled. But, more to the point, so did the flowchart. An investigatory committee recommended, among 23 pages of carefully chosen prose, that "studies be conducted towards finding a standards substitute for the apparently valueless flowchart."

Violence doesn't always accompany the demise of a scientific flat earth. But too much suppressed anger had attached to the flowchart for its fall from grace to be just another technological event.

'You a Stranger in Town, Mister?'

HUMAN CONNECTION/Jack Stone

Reorganization Should Give DP More Clout

Granting that improved long-range DP planning should result as DP managers move up to become high-level executives, there are other benefits that, I feel, would derive from this change. They relate to matters of human perceptions.

In brief, the new DP placement would bring full recognition of the significance of data processing — or information systems, if you prefer — to the firm and would make known, through implication, the intention of the chief executive officer to give as much attention to DP as to other major elements of the organization. This change should lead to a new perception by other members of top management — namely, that the chief executive wants DP to be integrated into the mainstream of the business and that DP's importance rivals that of other major components of the corporate society.

This article is part of a series, "DP Management in the '80s."

This change would help solve a serious management deficiency in many organizations. Without trying to be witty, let me rephrase the words of philosopher/raconteur Rodney Dangerfield to describe what I mean: "DPers don't get no respect."

Along with lack of respect comes lack of organizational stature — call it political clout, or even power, if you wish — to cut through the bureaucratic barriers of the company and get a job done. The marketing department is important in great measure because there's a vice-president for marketing sitting in a highly respected position to make it so, and the same goes for vice-presidents of other functions. It's time for many companies to open the slot of vice-president for management information systems (MIS) if they haven't already done so.

There's no need to go into any detailed history of how this problem developed — suffice it to say that the attitudes, interests and professional goals of DPers-at-large are much different from those involved with other functions of the business and, as systems have become more complex, the orientation of the typical DPer has become more orthogonal to the business direction than ever. The result, of course, is that DPers rarely feel a "part" of the enterprise — so the lack of respect is mutual.

Unfortunately, these feelings go all the way up to the top rungs of the DP management ladder. It's hard to find a senior DP leader who believes that his department has had a "fair shake" by the top executives. DP managers feel they have had far too much work to accomplish with too few resources and too little time. Indeed, most DP managers believe they are treated with little more repect than junior programmers in their dealings with the executives, especially when it comes to having a voice in setting the direction of the information systems activity, much less the general direction of the business. So it's not difficult to understand why members of the DP department don't show much love for their company.

Of course, there is the problem of finding a super DP manager — one who can deal successfully with a profit-and-loss statement in one moment and a GOTO statement the next.

But it's really up to the chief executive to accept the idea that the information systems activity has become a critical part of the business. And he must also understand that a vice-presidential position for MIS is needed to help ensure that these valuable resources are not being frittered away.

Letters to Stone should be addressed to him at Suite 222, 2233 Wisconsin Ave. N.W., Washington, D.C. 20007.

DEC, Data General, H-P communications costs are down

If you're supporting multiple remote terminals on your minicomputer system, whether from DEC, Data General, HP or anyone else, chances are you are paying a fortune in communications costs and probably not even running the terminals as fast as you'd really like to. And to add insult to injury, you have to put up with the occasional phone line 'glitch' which drives your CRT's crazy.

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THE TAYLOR REPORT/Alan Taylor

NCR Agreement Can Take Different Meanings

Phone calls about NCR Corp.'s Universal Agreement keep coming, and the known facts of the agreement are getting weirder. Even the name, "Universal Agreement," now appears to be a misnomer in the sense that the agreement is not the same for every NCR user.

Fortunately for any user who thinks he has been the victim of NCR misrepresentations, in one respect, the agreement gives real rights to the user, rather than to NCR. Under the agreement, the user can have the meaning of the agreement settled for his own individual case, and he doesn't have to get bogged down at the same time with claims of damages, as he would in the courts.

Although the Universal Agreement was dictated by NCR, it has many ambiguities and some potential local illegalities. The impact of ambiguities and the effect of illegalities are to be settled individually by a business-type decision, rather than by the hair-splitting of precedential law.

Of course, a provision in favor of one user may not be exactly in favor of another, and different arbitrators sitting in different cases may give different rulings. So the meaning of arbitrated Universal Agreement A can totally differ from the meaning of arbitrated Universal Agreement B. Just about the only "universal" about the Universal Agreement is the user's right to have the agreement construed against NCR!

Ambiguity, of course, is not uncommon in the consideration of contracts, and in the court system it does not become important until all related damage claims are brought. In the computer area, claims of this type get confusing and tend to obscure the ambiguity questions. However, in arbitration, such questions can be brought up separately from later damage claims. Arbitration allows the user to argue one topic at a time.

To consider how arbitration could make one agreement totally different from another, consider the situation of a sales representative who, after signing the customer up on the dotted line, makes a false statement to persuade the customer to stay on. He might say, for example, that some software firm is known to be competent and able to fulfill promises made earlier by the salesman or that five applications can be up and running on the system within a month when the system is only capable of handling the first of them.

Of course, the wording of the agreement might make most NCR promises, no matter how official, mere water under a bridge. NCR can ignore their accuracy unless the promises are physically attached to the agreement. However, many business people would say the requirement that promises made after the customer signs — but before NCR accepts the agreement in Dayton — must be attached is physically impossible, and contracts are supposed to deal with the possible. Particularly, in this category would be a service to be performed within a month, when NCR can easily take six weeks to decide whether to accept the offered contract.

The difference in meaning here could result in the user being able to force NCR into court, if he wants to, to answer about the facts of the misrepresentation after discovery has been able to ferret them out. Provided that the arbitrator has first decided in favor of the user on the ambiguity, the court will accept his decision and not second-guess it. If, however, the matter goes to the court first, there is a very good chance that the courts, noting that the meaning has not been decided by the arbitrator, would send both the ambiguity and the damage claim, which has to accompany it in the courts, back to the arbitrator.

Don't Overload the System

Again, regarding illegalities and their impact, the meaning of your particular Universal Agreement can only be settled in arbitration, and putting in other questions at the same time regarding damages overloads the system and can detract from the attention your argument may have.

Many states have laws that make false promises and misrepresentations illegal. The states may not have provided everyone with the right to sue for the illegality in every case, but if the Universal Contract is seen to authorize illegal behavior, an arbitrator may say that that part of the agreement should be struck out on public policy grounds. Again, this would make the arbitrated agreements differ.

Practically, the user keeps his advantage only if he does not confuse the meaning-of-the-agreement questions with damage claims.

So don't depend upon what other people — in or out of arbitration — think their Universal Agreement is. Yours is an individual and different item, at NCR's choice. If you don't know what it means, take the question to arbitration and find out *before* rushing on and making decisions about what you or NCR are responsible for. It's quicker, cheaper and better.

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Put Yourself in Their Shoes

(Continued from Page 27)

And then when the changes are rapid and dramatic, while the pressure is intensifying, the situation is aggravated beyond belief. I know, I sat there and watched the system go up and down like a yo-yo when I did a series on the FAA system for *Computerworld* three years ago.

The intensity of pressure and the resultant breakdowns and ulcers amongst controllers are more than well documented. It's pure folly to assume that those effects are contrived with wage parity in mind. Yes, we should give the controller the best equipment available. Yes, we should make the equipment and the systems as failure-proof and as idiot-proof as possible.

Recall, sir, that *you* ply those not-so-friendly skies right along with the rest of us. Talk with John Gallipault of the Aviation Safety Institute before you make such a wild assessment leading to such inane conclusions. He can give you horror stories that will keep you awake nights. Spend a few shifts in a busy Air Route Traffic Control Center. Walk a mile in their shoes.

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READER COMMENTARY/Michele Landon

War and Peace in the DP Department

There are four major groups of DP personnel — management, systems programmers, programmer/analysts and Operations. Among these groups, three minor wars are going on that make for a less productive and less congenial atmosphere.

The first conflict is between management and systems programmers. It can be summed up in one word: "documentation."

To the DP manager, the systems programmer is a person who either will not or cannot produce a piece of written evidence of his existence. It is almost impossible to get status reports, documentation or written procedures from him.

Consequently, the manager is in a precarious position when he has to write his status reports telling what the technical staff is doing. The lack of documentation and written procedures and the thought of what would happen if the systems programmer left the company is little less than a nightmare.

On the other hand, the systems programmer vaguely recognizes the need for reports and documentation, but he has his own problems. He is overworked, fighting brush fires, dealing with programmers' problems and trying to keep up his skills in a constantly changing field.

Even if he is conscientious, sits down Monday morning and writes a status report, the systems programmer is interrupted so many times that by noon, he has abandoned all hopes of getting it written.

Programmer vs. Programmer

This leads to the next conflict, that is, between the programmer/analysts who are doing the interrupting and the systems programmer. It is the systems programmer's responsibility to support and assist, but it is beond his comprehension why the programmer won't read the manual himself, check his own JCL or solve his own dump. Most of the problems brought to him could be eliminated if the programmer would just use the manuals.

In actuality, the art of reading a manual is exactly that — a technical skill. The programmer does not have either the technical education to help him read the manuals or the strong analytical ability required to interpret them.

If he did, he would be drafted onto the technical staff.

Programmer vs. Operations

The third minor war is between programmers and Operations.

The programmer has a system to implement or an enhancement to make and a target date to meet. The standards set up by Operations about when test jobs can be run, how they can be run, what tapes and disks can be used, how to put a program or file into production and how to take them out of production are all burdens he has to overcome so he can get his work done on time.

For Operations, the No. 1 priority is to keep production running. The standards are set up precisely to protect production programs and files from being tampered with by a programmer in a testing situation.

The operator has to get production out, mount the tapes and disks, keep control reports, put new paper in the printer and deal with hardware problems. For the operator, the programmer's testing requirements have low priority.

The truth is that each group has its own problems and reponsibilities; however, no one group makes the industry. The four groups have a symbiotic relationship, and the first priority of each is to make this relationship both productive and peaceful.

Landon is technical unit supervisor of the Commercial Lines Automated Division at Hartford Insurance Group in Hartford, Conn.

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Calldata Curtails Three Applications

WOODBURY, N.Y. — Users of Calldata Systems, Inc. services and applications products may have fewer to choose from in the coming months.

Calldata, the wholly owned commercial computer services subsidiary of Grumman Data Systems Corp., has been "looking at the profitability" of its various lines. Since September it has discontinued three of its applications — retail, project management and engineering, according to William Waas, director of strategic planning.

Waas emphasized, however, that customers still using these services suffered no interruption in technical support. The retail program was resold to its author, and project management and engineering, though placed on inactive status, continue to be maintained by Calldata's backup technical facilities.

When a product becomes inactive, Waas explained, it is taken off full marketing support and Calldata begins to phase out existing customers. Full technical support will continue until customers' projects reach completion, he said.

Waas admitted that Calldata is evaluating all of its lines — a process he expects will take another two months — and will try to divest those that are unprofitable. "The company is looking for a return on investment and in some areas we're not receiving the returns we want," he said, refusing to disclose what other products or services are on the block.

He did say that TS RJE/Batch, Calldata's remote service run on an Amdahl Corp. mainframe, will not be affected, even though the firm recently reduced prices for this service by up to 20%, depending on the amount of memory used.

This reduction, Calldata said, "was made primarily to attract new business to use Calldata for remote processing" using large memory data base management systems such as Mathematica, Inc.'s Ramis II, Infodata Systems, Inc.'s Inquire and Intel Corp.'s System 2000 and statistical packages such as SAS Institute, Inc.'s SAS, SPSS, Inc.'s SPSS and Cambridge Computer Associates' Crosstabs.

As Calldata fleshes out its less profitable products and services, "certain members of marketing and sales staffs will be laid off," Waas said. The firm plans to close its Houston office next week, he added, noting "there are no customers in or associated with that office."

Applications Packages Gaining Attention

By Don Leavitt
Special to CW

Although application packages generally do not show up in such forums as the annual Datapro Software Honor Roll, they are gaining recognition where it counts — in increased sales.

Most of the horror stories that abounded in the early days — the early '70s, that is — have now become little more than part of the folklore of the DP community. Users generally have learned enough about the potential benefits of using packages. Now they're beginning to get more serious and more effective in the selection process.

It is not that the classic steps in the process have changed. It still starts with identification of a need within the organization, goes on to a broad-ranging search for packages that might serve the purpose, and then moves into a narrower, more concerted evaluation of serious candidates, actual selection, implementation and, in too few installations, a post-installation audit of how well the package lives up to expectations.

Users Leery

But users — including the DP technicians within their organizations — have become leery of some of the procedures within those steps. And in the case of packages that can have a major impact on how their organization manages its business, users are finding there are outside consultants that specialize enough in particular application areas, without selling packages in that area, to be of significant help in locating the best software for their special needs.

Talking to users across the country, I get the feeling that the effort to identify specific capabilities, to weight them by their importance and then to score prospective packages according to how well they meet the precise specifications, has just about gone by the boards.

There is still a concern about whether a package meets a need — and whether the "need" is a necessity or a nicety — but gut-feeling has taken over from apparently logical but essentially artificial mathematical scorecards.

(Continued on Page 42)

HP 3000 Line Gets Ansi 74 Cobol

PALO ALTO, Calif. — Lagging behind many of its competitors in the minicomputer field, Hewlett-Packard Co. is now offering Ansi 74 Cobol for its HP 3000 Series II, III, 30 and 33 processors.

Until now, only Cobol-68 was available from the firm as Cobol/3000.

Cobol II/3000, as HP's Ansi 74 Cobol version is called, implements at the highest level — Level 2 — nine of the 12 modules defined by Ansi Cobol X.3.23-74 specifications, a spokesman said. The nine modules are nucleus, table handling, sequential access, relative I/O, indexed I/O, sort-merge, segmentation, library and interprogram communications.

HP did not implement the Cobol report writer, debug or communications modules of X.3.23-74 because those functions exist already in other HP subsystems, the spokesman explained — report writer on HP's RPG-II and Query, debug on Debug/3000 and communications on DS/-3000.

HP stated that "this level of implementation has previously been offered only by mainframe manufacturers." However, Data General Corp., for one, refuted this claim. A spokesman for that vendor said DG's Ansi 74 Cobol, introduced in September 1978 to run under its Advanced Operating System, also implements the same nine modules at Level 2.

In addition to meeting the Level 2 standard, HP implemented in Cobol II/3000 several extensions not available in Cobol/3000, according to the HP spokesman.

(Continued on Page 40)

'Easytrieve' Version 8.2 Eases Access to Cullinane's IDMS

OAK BROOK, Ill. — Version 8.2 of Pansophic Systems, Inc.'s Easytrieve data retrieval system will be available Feb. 15 to both OS and DOS installations, with capability that makes it easier to access data from Cullinane Corp.'s IDMS data base, the vendor said.

This latest Easytrieve release includes a path call for IDMS through which a user can specify the IDMS records he wants to retrieve from one starting point without having to know IDMS commands, according to a Pansophic spokesman.

Where a "path" is defined as one or more related data base records, path processing can be performed by either a sequential sweep of one or more areas or by a random key, and path records

(Continued on Page 40)

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'Environ/1' Gains Task-Level Recovery Facility

CINCINNATI — A task-level recovery facility added to Cincom Systems, Inc.'s Series 80 Environ/1 teleprocessing monitor reportedly lets users recover from program failures in an online environment without impacting other terminal users.

In case of a failure, the task is recovered up to the last input so no transactions other than the one involved in the actual error are lost, a Cincom spokesman said.

Previously, Environ/1 users had the option of using a checkpoint restart/recovery facility that recovered systems to a specific checkpoint. Whether checkpoints were taken on a time basis or initiated through programming, users could lose some transactions between the last checkpoint and the time of failure, the spokesman noted.

The task-level recovery feature consists of five logical facilities: extended resource locking; task logging; reset; recovery; and the Commit function, a command that informs Environ/1 that a logical transaction is complete and that all updates can be committed permanently to the system.

With extended resource locking, data records modified by a transaction will be held — protected against modification by any other task — until updates are "Committed," the spokesman explained.

Task logging uses a disk-based file to log changes to the data base on a transaction-by-transaction basis to make backing out individual transactions easier, the vendor claimed. The file space reportedly can be reused after committing a transaction; therefore, on the average, less than one track on an IBM 3330 drive is required per terminal, according to the spokesman.

The reset facility is said to automatically back out the updates of a failing task to its last Commit, leaving other processing tasks unaffected. Recovery is automatically invoked after a complete system failure to back out all active tasks to the status of their last Commit.

More Memory

Environ/1 with task-level recovery requires 35K bytes more memory than checkpoint restart/recovery, which used about 180K bytes under DOS and approximately 240K bytes under OS, the spokesman estimated.

The monitor with the task-level recovery facility for OS and DOS users rents for $375/mo or can be purchased for $15,000 plus a $1,000 per year maintenance charge after the first year. By comparison, with checkpoint restart/recovery — which is no longer available — Environ/1 rented for $240/mo and could be purchased for $10,000.

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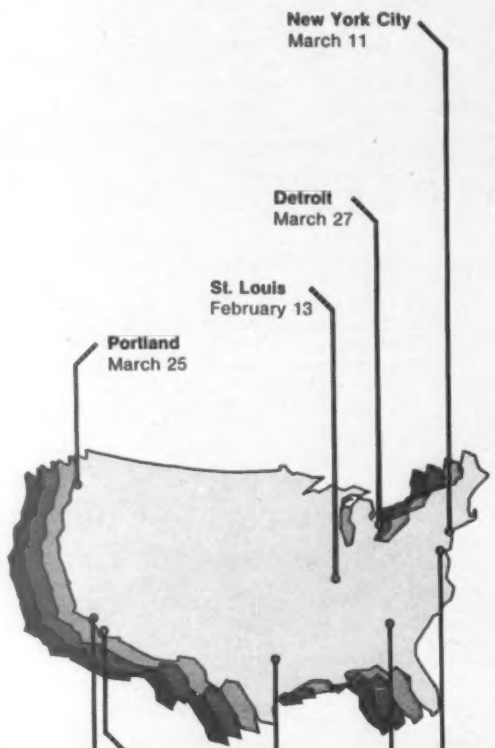

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'Ascii Xbasic' Released for 1100

SILVER SPRING, Md. — Language and Systems Development, Inc. has released a version of its Xbasic for Univac 1100 series mainframes that conforms to Ascii standards.

Although the vendor claimed the differences between the old and new versions of the language are minimal, it is not offering the updated version free to current Xbasic users.

Programs written in the earlier version of Xbasic may have to be run with an option switch turned on, and a few older character set-dependent programs may require some changes, a spokesman said.

Features Ascii Xbasic shares with the earlier version include programmed error handling, virtual arrays, sequential and random file handling, dynamic memory expansion and contraction, program chaining, multiple statements on a line, continuation of statements and logical and string expressions, according to the vendor.

Available as an option is an Abasic compiler, a batch compiler that processes source programs written in Xbasic into elements that can be relocated into executable modules.

An extension called E-option is also available on the Xbasic or Abasic compiler. This option reportedly allows the processors to handle most of the language constructs used to develop CSTS Basic programs.

The Ascii Xbasic sells for a one-time cost of $21,000. Lease rates range from $440/mo to $674/mo, depending on the term of the lease, the vendor said from 8121 Georgia Ave., Silver Spring, Md. 20910.

Free Seminars Start Tomorrow in N.Y.C.

NEEDHAM, Mass. — A series of free one-day applications software seminars will be presented by McCormack and Dodge Corp. beginning tomorrow and continuing through May.

The seminars will focus on the firm's Pluss line of applications packages including the G/L Plus general ledger/financial analysis system, A/P Plus accounts payable information system, F/A Plus fixed-asset analysis and accounting system, CPA Plus capital project analysis and accounting system and P/O Plus purchasing information management system.

The first seminar will be held tomorrow, Feb. 12, at the Hilton Hotel in New York City, McCormack and Dodge said from 560 Hillside Ave., Needham, Mass. 02194.

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Real-Time Monitor Unveiled On-Line For CICS Systems

BOSTON — A real-time monitor that reportedly allows a programmer to diagnose and correct problems as they occur in on-line systems running under IBM's Customer Information Control System (CICS) is available from Communication Software Aids.

Called CICS/Inform, the monitor includes an off-line program that preprocesses CICS system Dsects and places the screen image formats on a data set for display by one of the CICS/Inform on-line programs, the vendor said.

CICS/Inform contains both global and specific monitoring facilities. For global monitoring, CICS/Inform displays status for terminals, files, transactions, programs, tasks, dynamic storage, Vtam as well as system control information. For specific monitoring, it displays memory in hex and character formats and any disk records available through CICS-supported access methods, according to the vendor.

CICS/Inform can be used with any IBM 370 or equivalent mainframe and with any CICS 3270-compatible terminal.

CICS/Inform is available for OS/-VS at an introductory price of $4,800 until June 30, the vendor said from Suite 618, 80 Boylston St., Boston, Mass. 02116.

Entry-Level Novas Get Cobol Operating System

WINTER PARK, Fla. — An entry-level Cobol operating system for Data General Corp. minicomputers as well as Nova look-alike CPUs is available from Information Processing, Inc. (IPI).

Mini-Blis allows the user to bypass Basic as a first-time language, IPI said, eliminating the need to convert to Cobol at a later date.

The package was designed for low-end minicomputer users or high-end microcomputers including DG, Fairchild Camera & Instrument Corp. and Nanotech Corp. MPUs, the vendor said.

Features include multiuser capabilities in an on-line and virtual memory environment. Options include concurrent communications between a minicomputer and a host, the vendor said.

Mini-Blis allows the user to add up to 30 on-line terminals as well as other multiuser functions, according to IPI.

The package costs $1,500, with deliveries slated to begin Feb. 29, the vendor said from Suite 20, 1850 Lee Road, Winter Park, Fla. 32789.

IBM Users Gain Payroll System

ANDOVER, Mass. — A version of the Payroll/Personnel system is available for IBM System/3 and System/34 users from Software International Corp.

Additional processing and reporting capabilities include automatic check voiding, a deduction arrears option, separate accumulation of bonus and commission amounts, paystub messages and reminder notices.

Written in Cobol, the new package retains features of the original system such as multipayroll capability; federal, state, county and city tax calculations; deduction, accrual and check procedures; and general ledger interface, the vendor said.

The enhanced Payroll/Personnel system costs $17,000 for the System/3 and $18,500 for the System/34. Software International is at 2 Elm Square, Andover, Mass. 01810.

Graphics Package Written in Pascal

SANTA CLARA, Calif. — A graphics software package written in the licensed version of UCSD Pascal was introduced by Ramtek Corp. for use on its RM-6114 color and RM-6113 black-and-white graphics systems.

Called Graphpro, the package consists of a set of routines and procedures that eliminate the need for programmers to go to the pixel level for their constructions, a spokesman said.

Graphpro can support such applications as business charts, computer-aided instruction, plotting, forecasting and modeling and statistical analysis.

The package, said to be consistent with Siggraph Core Standards of August 1979, licenses for $1,750. Ramtek is at 2211 Lawson Lane, Santa Clara, Calif. 95050.

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DS990 Users Gain Ansi 78 Fortran, Cobol

AUSTIN, Texas — Users of Texas Instruments, Inc.'s DX10 system software can get Ansi 78 Fortran and DX5 Cobol runtime, sort/merge and IBM 3780 or 2780 communications emulator packages.

The TI Fortran release is for TI's DS990 minicomputers models 4 through 30 and any system based on the 990/10 or recently introduced 990/12 minis, TI said.

DX10 Fortran-78 was designed around the recently approved Ansi Fortran design document X3.9 of 1978. The language is for high-level programming and will allow the user to naturally express algebraic formulas and numerical problems.

DX10 Fortran 78 features include process control extensions, mathematical/statistical library and interfaces to generalized forms language, sort/merge and data base managements.

The TI Fortran costs $3,000 or can be leased for $90/mo, according to the vendor.

The second TI language release consists of the DX5 operating system and DX5 packages for Cobol runtime, sort/merge and IBM 3780 or 2780 communications emulator, TI said.

With this product, Cobol development can be done on DS990 models 4,6,8, 20 and 30 using DX10 Cobol, the spokesman added.

Also available are two optional support packages: DX5 sort/merge and DX5 3780/2780 communications emulator.

The DX5 interactive software package costs $4,450 for systems with a DS25 disk configuration. The DX5 sort/merge option for the same configuration costs $4,200, and the DX5 3780/2780 communications emulator for DS25 configurations costs $2,600, the vendor said from P.O. Box 2909, Austin, Texas 78769.

HP 3000 Gets Ansi 74 Cobol

(Continued from Page 35)

One is a microcoded instruction set in which frequently used Cobol instructions are coded in firmware, a feature HP claimed has improved runtime efficiency as much as 60% over earlier HP 3000 Cobol compilers.

Microcoded in the instruction set are the edit instruction that produces formatted output and a PERFORM statement, said to decrease overhead for transferring control to other sections of code within a structured program.

The debugging aids include Verbmap, a command that locates in the source code any questionable instruction and determines the results generated by that statement, and CROSSREF, a command that provides all symbols, labels and their locations in the source code.

Cobol II/3000, which also accommodates packed data arithmetic (Comp-3), reportedly has access to the HP Multiprogramming Executive (MPE) operating system's full power through direct calls to system services such as the Image 3000 data base management system, V/3000 business forms generating data entry subsystem and distributed systems network communications software, HP said.

The initial right to use Cobol II/3000 costs $3,000 in the U.S., including documentation; the right-to-copy fee is $1,200. Software support including phone-in consultation costs $100/mo from the time of installation.

Current Cobol users on HP 3000s will receive a $600 credit toward Cobol II/3000, HP said from 1501 Page Mill Road, Palo Alto, Calif. 94304.

Pansophic Eases Access to IDMS

(Continued from Page 35)

become the primary input into the job. The spokesman noted IDMS sign-on functions BIND and READY are automatically issued by Easytrieve.

Release 8.2 also includes new PARM statements to modify on a per-job basis the system default for number of print positions (SYSPRINT or SYSLIST size) and to supply the number of positions on which to center if the NARROW option is specified on the LIST statement, the vendor noted.

In addition, the capability of Easytrieve's macro facility was extended to be a relative-record Vsam file, in addition to the current options of being a Bdam file or Panvalet library. The spokesman said this was done to accommodate IBM 4300 processors which do not support Bdam.

SYSIN and SYSPRINT exits have also been added in Release 8.2. The SYSIN exit provides an alternate method to supply input to Easytrieve, which is read in from SYSIN, the spokesman explained. The SYSPRINT exit accepts all output from Easytrieve, which is then output on SYSPRINT.

Pansophic claimed Release 8.2 uses no more core memory than the previous version, which uses 72K bytes. Easytrieve version 8.2 licenses for $14,500 (DOS) or $18,500 (OS), including documentation and maintenance for the first year.

Lease plans are available for 24-, 36-, 48- and 60-month terms. For 24 months, for example, Release 8.2 leases for $1,045; for 36 months, $820.

Pansophic is at 709 Enterprise Drive, Oak Brook, Ill. 60521.

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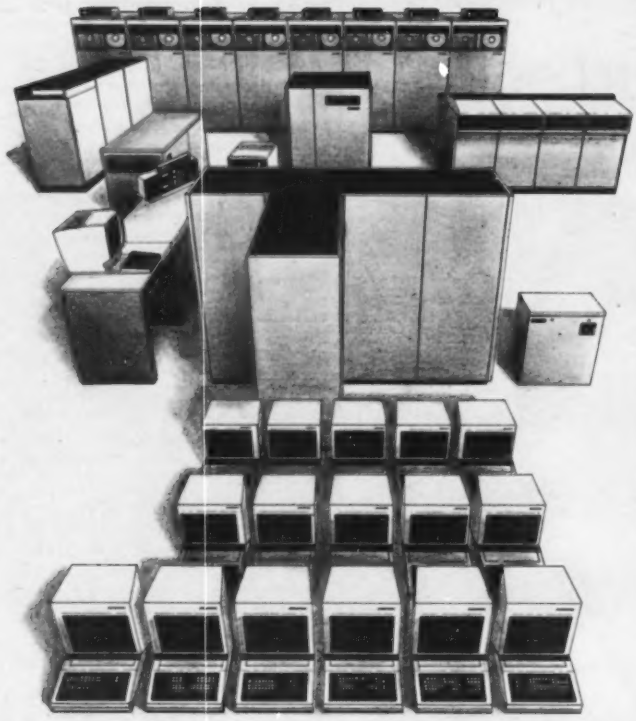

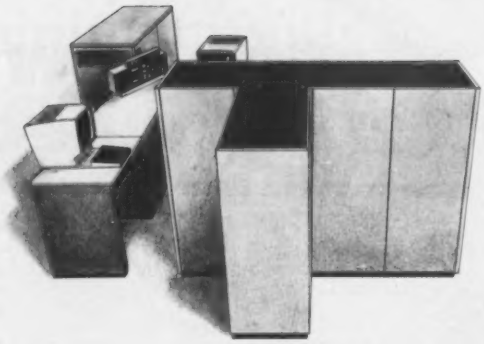

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Packages Enjoying Increased Sales, Recognition

(Continued from Page 35)

Once a need has been identified, many evaluators say they look in the various directories and trade papers to see what is available and might fit their need. But others also describe the way they keep a file of all the mailers they get that seem to have any relevance to their organization. Then when a need does surface, they already have at least basic information about some candidate packages.

A real problem with such a user-built file, it seems to me, lies in the rapidly changing world of hardware systems possibilities. Mailers may come through and be discarded in the spring because the product runs on minicomputers while the user's data center is mainframe-based.

If the organization changes over to mini-based distributed processing, the folders on mainframe-based products will be worthless and the already-trashed ones become the ones that are really needed.

User Lists

"Everyone" knows that potential buyers should ask vendors for names of current users, but a growing number of buyers are becoming aware of the risks they face in using such lists, unless the buyer and his staff are willing to put some real effort into their contacts with the users. Point one, obviously, is that the vendors aren't likely to release names of dissatisfied users.

But serious questioning of the users whose names are provided can sometimes lead to just such dissatisfied ones, and a talk to them can highlight a problem that could be critical to the prospect's evaluation.

In any case, calls on current users are worthless if they are limited to casual, open-ended questions. "What do you think of the package?" generally doesn't get more of an answer than it deserves, and whatever the answer is will vary with the interest and the work load of the person answering.

More Effective Aproach

Various users have described a more effective approach to interviewing users. Instead of particularly matching their DP technicians with those of the current user, they ask the manager of the department that will benefit from the package to assign someone to talk to a person from the counterpart department in the using organization.

That's when the meaningful questions surface — "How does the package handle?" or "What happens if the government regulations change?" —to tell the users what they have to know.

Only after such user-oriented concerns are satisfied is there any purpose in determining if the package will fit comfortably in the available DP environment, or in finding out how easy it is to use, technically.

Trial Periods

The request for trial periods makes sense to some potential buyers but is disparaged by others, and it seems to have equally mixed reactions from vendors. In any case, perhaps a growing number of both users and vendors now recognize that trying out a system that has been installed on one of the remote computing service networks allows considered evaluation over a long, or short, time span without major expenditure or commitment by either party.

The specialized evaluators are perhaps the most interesting recent development in the selection process. Leo Cohen and his staff at Performance Development Corp. set the stage, in one sense, with their comparative studies of data base management systems. However, firms such as Manufacturing Software Systems, Inc., (MSS) from Williston, Vt., have produced what that firm describes as "consumer reports" on packages offered in support of the manufacturing applications — especially material requirements planning.

MSS first defined what it considered a standard system then compared real, identified packages to that model, highlighting both strengths and weaknesses. To date MSS has evaluated 20 different packages, but it also sells the standard program to users who wish to conduct their own evaluations of other packages.

The standard system costs $650 and the individual evaluations cost $500, $400 or $300 each, a spokesman said, claiming — with apparent justification — that such packaged evaluations are just as cost-effective compared to an in-house evaluation as packaged software is, compared to programs developed in-house to meet a very conventional application.

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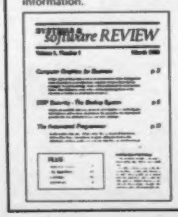

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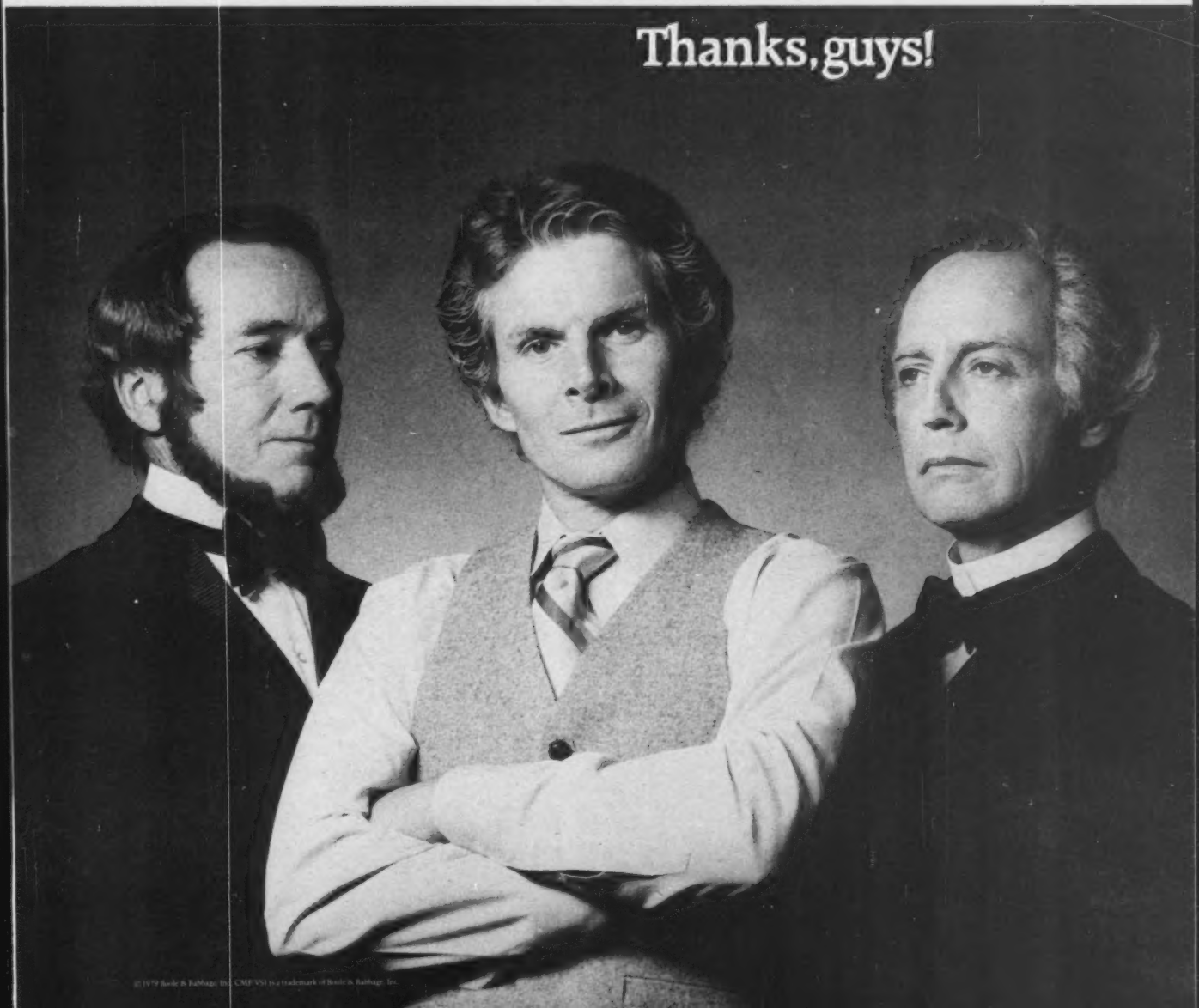

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Study Sees Satellites, Cable TV Tied

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — Communications satellites teamed up with cable TV local distribution networks are likely to become a major data transmission medium in the 1980s, a study just published here by the National Telecommunications and Information Administration suggested.

Transcommunications Corp., of Greenwich, Conn., author of the study, pointed out that the use of satellites to broadcast entertainment programming has created space earth-station capacity that is now beginning to be used for other purposes.

"The capacity of an earth station...coupled with the capacity of cable...is beginning to attract nonvideo users as well as presently enfranchised common carriers," the study noted. While "legal, technical and marketing" problems, as well as controversies among various suppliers, are restricting nonvideo use of cable TV networks, progress on this front appears likely within the near future, the study indicated.

Enabling Technology

Several technological improvements in recent years have increased the traffic-carrying capacity of satellite transmission channels, thereby potentially reducing the cost of using hybrid satellite/cable networks.

For example, cross-polarization permits two signals of the same frequency to be transmitted from the same transponder to a given earth station, effectively doubling the satellite's capacity. However, since more sophisti-

(Continued on Page 46)

Front Ends Hike Control Of Processors By Burroughs

OKEMOS, Mich. — Users of Burroughs Corp.'s medium-sized mainframes have gained a host-resident message control software system that interfaces with Burroughs' Network Definition Language (NDL).

From Systems Research, Inc., the front-end SRI/DCS Model 50 system is claimed to add system access and security control, audit/recovery, transaction definition, remote print control and control of message routing, among other capabilities.

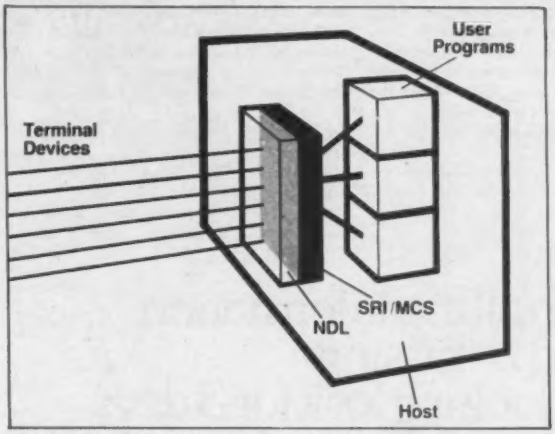
Burroughs users now have a choice of four entry levels to on-line processing and the flexibility to upgrade their DP systems to match growth paths, according to a Systems Research spokesman.

Those alternatives are the Model 50 and three other minicomputer-based SRI/DCS systems: Models 100, 200 and 300 (see figures on Page 56).

The Model 50 reportedly defines a transaction as a conceptual process executed by the CPU in response to a request from a terminal. A transaction may include several exchanges of information between the terminal and the application program, a spokesman observed.

The Model 50 employs a global definition of each transaction to route messages, the source conti-

(Continued on Page 56)



The Model 50 from Systems Research, Inc. controls message and transaction processing for mid-size Burroughs Corp. mainframes, interfacing with that vendor's Network Definition Language.

DEC Terminal Has Room for Micro

MARLBORO, Mass. — Digital Equipment Corp. has introduced a version of its VT100 CRT terminal that allows the user to "build in" a microcomputer facility.

DEC's VT103 terminal has an LSI-11 microprocessor backplane so the user can configure an LSI-11 within the terminal's enclosure, a spokesman said.

Two models are available, both said to resemble the VT-100 in appearance. The VT103-AA is the basic product; for $900 extra, the VT103-BA has an additional dual-drive Dectape II cartridge subsystem.

For both versions, the user must include communications lines in their designs to link the display station's processor and terminal sections.

The two versions of the VT103 can incorporate DEC's LSI-11/2 and LSI-11/23 microcomputers and a range of LSI-11 bus options, the spokesman said.

The VT103-AA costs $2,990 and the VT103-BA costs $3,890, DEC said from Maynard, Mass. 01754.

Terminal Emulates VIPs

DALLAS — An interactive terminal system that emulates Honeywell, Inc.'s VIP 7760 and 7700 terminals while offering capabilities those products are claimed to lack was announced recently by Harris Corp.'s Data Communications Division.

The Model 8760 terminal system can drive up to 32 CRT terminals and 32 printers, a spokeswoman said. The 8760 also has an integral diagnostic line monitor but, unlike the Honeywell terminals, can be configured without diskette support.

The basic 8760 has a 32K-byte processor, 960- and 1,920-char. screens. Available with the system are 40-, 60-, 120- and 165 char./sec serial printers and a 200 line/min printer.

With two, four and eight displays, the 8760 costs $8,599, $14,037 and $23,913, respectively, Harris said from 16001 Dallas Parkway, Dallas, Texas 75240.

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Guide Details Modem Sellers

PENNSAUKEN, N.J. – A management guide to suppliers of modems and acoustic couplers is available for $15 ($10 postpaid) from Alltech Publishing Co., 212 Cooper Center, N. Park Drive & Browning Road, Pennsauken, N.J. 08109.

The directory identifies 27 suppliers and profiles the industries they serve, including banking, brokerage houses, financial services, government, manufacturing, real estate, transportation and utilities.

The report provides business profiles as well as the addresses and phone numbers of the vendors.

Digital PBX Users Gain Software

NOVATO, Calif. – Users of Digital Telephone Systems, Inc. (DTS) digital private branch exchange (PBX) systems can now take advantage of software for automatic route selection, callback queuing and tandem switching.

The software is available for DTS' D1201, D1202 and D1204 PBX systems. Automatic route selection (ARS) provides computer-programmed control of trunk call routing through public and/or private networks over the least expensive path. Calls within the network are made by first dialing "9"; outside calls require the user to dial "8."

Once the number has been dialed, the PBX places it on the basis of how it best uses up to 50 types of trunks, 256 trunk routes, 16 time-of-day patterns, 16 queuing time delays and 16 station classes of service, according to DTS.

Queuing Feature

The callback queuing feature allows for queuing time delays for each trunk route for each user before the system searches for and offers an alternative trunk to that station user. The tandem switching feature allows the interconnection of PBXs into a network using a uniform dialing plan for all satellite and tandem PBXs so that every station on the PBX has a unique calling number regardless of from where the call originates.

Any one of the 1200 series models, when equipped with ARS features, can be used as part of a network of other PBXs. For example, the DTS PBX can be assigned as a central routing switch for the rest of the private network, according to the vendor.

Data for operation of the ARS is input through a cartridge tape. Changes to tape data are accomplished on-site through an RS-232C interface or by DTS.

Addition of the ARS feature can be made to any one of the 2,500 D1200 systems already in the field by adding a four-track cartridge tape facility to the software described here.

DTS indicated that it is difficult to fix a price on the software because of the diversity of the systems on which it will be installed and the applications for which it will be used, so the prices given here can serve only as guides.

Software for a D1201, for example, with 72 computer boards and connected to 40 phone stations, costs $14,951. This includes the cost of one attendant to operate the system and rotary dialing.

The D1202, which is roughly twice the size of the D1201 but with 100 phones, costs $140,000. DTS can be reached at P.O. Box 1188, Novato, Calif. 94947.

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CW-2

Satellites Tied To Cable TV?

(Continued from Page 45)

cated and hence more expensive earth stations are needed, overall costs have been shifted rather than reduced.

Further improvements in smaller diameter earth-station antennae are expected to reduce these costs, however – specifically, improvements encouraging wider use of 4.5- to 5-meter antennae which can both transmit and receive.

Another impediment, according to Transcommunications Corp., is the lack of "simplified, low-volume transmission techniques" and economical terminal equipment.

"Nonvideo transmission ... seems to be less well understood [than video transmission] and the complications of terminal equipment for accessing nonvideo transponders can be confusing and involved," the study pointed out. "Very often, nonvideo traffic demands two-way transmission and a system control which provides convenience of access and routing."

Only "a very few carriers" have considered these problems. However, "this situation is changing on almost a daily basis. In fact, many alternate solutions are being proposed or ... studied."

Although future costs are likely to be significantly lower, present earth terminals suitable for two-way nonvideo traffic "regardless of the modulation or multiplexing system used, require investments in the six or seven figures," the study reported. "These equipment costs must come down if the satellite communications goal of 'anywhere' to 'everywhere' is to be realized."

The sharing of satellite earth stations may be the answer to this problem. The Federal Communications Commission has not yet decided whether to approve such an arrangement, but it is considering a number of requests, including one by Western Union.

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CW211

Three Digital Voice Models

Audio Response Unit Has Automatic Switching

WATERTOWN, Mass. — An audio response system that reportedly combines digitally encoded human speech communications with an automatic communications switching system has been introduced by ASI Teleprocessing, Inc. Solidvoice is available in three models for users whose systems range in size from a single host CPU to a network of computers. It offers a vocabulary ranging from 32 words to 1,250 words, according to a spokesman.

Solidvoice allows the user to set up bill payment by telephone, verify credit, enter orders or incorporate Solidvoice into an existing terminal network to include Touch-Tone input. In its largest application, the system can be used to integrate audio response into a large-scale, multinode packet-switching network, the spokesman said.

The heart of the system is a user-programmable communications processor with a vocabulary that is also determined by the user. Either the user or ASI makes a tape of the words chosen for the vocabulary. ASI takes those analog signals and compresses, equalizes and samples them into a series of 8-bit digital bytes.

Each word is edited to remove extraneous bits of data (for greater storage efficiency) and encoded into a stream of bits using a proprietary speech-encoding algorithm, according to its maker.

How It Works

How does Solidvoice work? In a typical application, a user activates the system by pressing valid keys on a telephone's Touch-tone keypad. Within the processor, a decoder converts each Touch-Tone entry into a digital format and stores it in a buffer until the end of the transaction.

A software module called Host Process, emulating a host-compatible device such as an IBM 3271, formats the message for input to the host computer. Once the operator's request has been acted on, the host triggers Solidvoice to convert the response into speech.

Solidvoice determines how the message will be spoken, retrieves the appropriate words and "speaks as many as 96 messages simultaneously over as many telephone lines," according to ASI.

The microcomputer-based Solidvoice 4010 and 4020 have 56K bytes of main memory and support Touch-Tone-type and Bell Transaction Telephone 1 (audio-only) terminals.

The 4010 can be built with a vocabulary of 32 to 128 words, while the 4020 handles up to 1,024 words.

The 4010 supports four to 32 speech lines; the 4020 handles eight to 96.

The minicomputer-based 4030 can store 32 to 1,250 words and handles up to 96 speech lines. A dual floppy disk storage system and system console are standard on this model, but optional on the other two models.

All three systems include a serial interface, while the 4030 adds a channel interface.

The 4030 is the only one of the three systems supporting digital channels and it supports Bell's Transaction 2 (serial output) terminals. Further, the largest system can be used in a network of computers and offers multiple host interfaces, ASI said.

Although the spokesman noted that specific system costs are dependent on such factors as the configuration, type and size of the host system, he gave approximate costs of $10,000 per 100 words of vocabulary, between $1,000 and $1,500 per speech line, $5,000 to $10,000 per host interface and $10,000 for the main Solidvoice processor.

ASI Teleprocessing is at 101 Morse St., Watertown, Mass. 02172.

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Comm-Stor Gets Extended Editor

ROCKVILLE, Md. — Users of the Sykes Datatronics, Inc. Comm-Stor communications storage terminals can buy an extended editor option for those terminals from Alanthus Data Communications, Inc.

The read-only memory-based option was designed to improve the off-line message preparation capabilities of the Comm-Stor models S-560 and 565, Video Storage System and the Printer Storage System.

The option cost $275 or $12/mo over one year, Alanthus is at 6011 Executive Blvd., Rockville, Md. 20852.

Refresh Terminal Available for $24,500

BALTIMORE — With 4,096 by 4,096 pixel resolution, a vector refresh intelligent terminal designed for such applications as simulation, data analysis and nesting is available from Vector Automation, a graphics systems house.

The standard 21-in. Graphicus-80 terminal comes with a firmware processor, 95-key Ascii keyboard, RS-232C serial interface and a diagnostic panel. It costs $24,500, the vendor noted from Village of Cross Keys, Baltimore, Md. 21210.

THE NEW, LOW-COST IBM ASCII TERMINAL

The do-it-yourself IBM 3101 display terminal. You choose from two basic configurations, which range in price from $1,295 to $1,520. You set it up and quickly learn to operate it by yourself. You can swiftly diagnose and correct many malfunctions yourself. You order the 3101 with just one phone call and, for the character-transmission models, get delivery as fast as 60 days after you sign the contract. To top it off, you get the high quality, performance and dependability you expect from IBM.

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Volume procurements can save you up to twenty percent for either of the two configurations of the IBM 3101. One configuration, with character transmission, lets you use it like a teletypewriter. The other has selectable character or block transmission. In block transmission, it provides sophisticated editing capabilities such as insert/delete and full cursor control, along with field functions like blinking, high intensity and protected fields.

A convenient ASCII terminal

Accessible setup switches allow do-it-yourself selection, such as line speed, parity, scroll and reverse video. And since the IBM 3101 weighs only 38 pounds, it can easily be moved to where the work is.

Both models, which can generate all 128 ASCII characters, are ideal for most interactive applications and may be used with an IBM or non-IBM computer. And these terminals are even more versatile when used with our new 3102 buffered printer.

Human engineering inside and out

The 3101 lets you decide what's best for you. The 12-inch diagonal screen can be swiveled and tilted to cut interference from overhead lighting. Display the maximum of 1,920 characters in 24 lines and you'll see they're as distinct in the corners as in the center of the screen. For your viewing comfort, with the flick of a switch you can select green characters on a black background, or black on green. And there's a detachable contrast-enhancing filter to reduce glare.

The keyboard is moveable, so you can angle it to the screen to suit your comfort and eyesight.

The keyboard looks familiar because it's much like the IBM Selectric®. The 87 keys include a numeric keypad, graphic character keys, cursor positioning controls and dished home-row keys for touch typists. And the keytops are textured to reduce glare.

Diagnose malfunctions yourself

The terminal is designed to help you troubleshoot problems. The cause of equipment failure is displayed on the screen, using the twenty-fifth line. If you then follow simple instructions, you can generally isolate the source of the problem and correct it. If the equipment has a malfunction that can't be fixed in this way, the modular design of the 3101 lets you replace any of the three elements – video, keyboard and logic – while you send the faulty element to an IBM repair center for prompt service.

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Setup is do-it-yourself. You place the video on top of the logic element, connect the keyboard and video element and plug in the 3101. Then you simply use the appropriate setup switches to select the desired mode of operation.

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To Cut In-State Toll Charges

Arizona Bank Plans Net Around Phone System

By Jay Woodruff
CW Staff

PHOENIX — A statewide bank based here plans to protect itself "from the greatest percentage of anticipated future tariff" increases when it completes its computerized phone system network.

The Arizona Bank, with 2,000 employees in 84 branches throughout the state, expects that the network, along with a proprietary microwave communications system, will greatly expand customer service, according to Linda Van Kleeck, assistant vice-president of the bank.

To date, the bank has installed a computerized phone system (CBX) with 140 lines at its Tempe branch and the offices it serves in that area and will install another system for the Tucson area in April. Three more installations are planned for completion this year and a total of nine will be in place by June 1981.

When completed, the net will tie together all 84 branches. And, according to Van Kleeck, it will operate on ac power with dc backup, reducing the potential for downtime.

The bank has been using a smaller network up to this point, based on Centrex Corp. Model II and Nippon Electric Co. NA-409 central office machines for phone switching, but these systems are being phased out as their duties are taken over by systems from Rolm Corp.

Stringent Requirements

Arizona Bank has "very stringent requirements" for the system, Van Kleeck said, some of which "are beyond the capability of any switching system at this time." The bank wants the ability to customize the network to meet the needs of each community in which it operates, to centralize, decentralize and move the systems at will, to greatly expand the generation of management reports and to develop cost comparison methods.

The microprocessor-based Rolm ETS-100 phone was another reason for deciding on the Rolm system, according to Van Kleeck. It has 16 single button-activated features that will aid the bank in managing its calls.

Waiting calls can be displayed while the user is taking another call. The phone also indicates who within the network is making the call.

The Rolm system resists obsolescence, she said, and it provides the foundation for future applications. And in conjunction with the microwave system that could be installed to reduce the bank's dependence on statewide calling over the Mountain Bell phone system, the bank thinks it can keep its costs down.

Once completed, the system will enable any branch office to call any other branch by dialing a four-digit number. All incoming calls for branch information from suburban and outlying areas will be received by one of two attendant centers to reduce the time and staffing required for call handling, she indicated.

Redundant Systems

Every system within the network will be redundant, and the Rolm system "is the only one that was redundant to the degree required by the bank," Van Kleeck said. The bank also wanted to be able to retrofit switches to the system in the future, she added.

The installation was begun in January 1978 when the bank put in a small CBX system in Tempe. Five months later, the system was upgraded from 140 lines to 500 lines and full redundancy was added, along with Rolm's Advanced Automatic Call Distribution software.

Van Kleeck characterized the upgrade at Tempe as "difficult" because it involved upgrading and retrofitting equipment at the same time. Still, it went relatively smoothly because of the vendor's capability, although it was difficult for Mountain Bell to maintain the grade of transmission the bank desired during the switchover, she said.

Bank Expectations

As it grows, the network is expected to improve the quality and quantity of bank services and will extend the bank services to the widest percentage of the market area as possible.

One feature that should keep the lid on phone costs will be route optimization, which will lower toll charges for outgoing long-distance calls from the bank's branches. The CBX will route all calls within area 602 (Arizona) over the most economical route, usually a tie line to the branch CBX nearest the call destination.

Will the network meet the Arizona Bank's requirements when it is completed in 17 months? As far as Van Kleeck is concerned, the bank planned the system sufficiently well so that there is no reason why it should not meet expectations.

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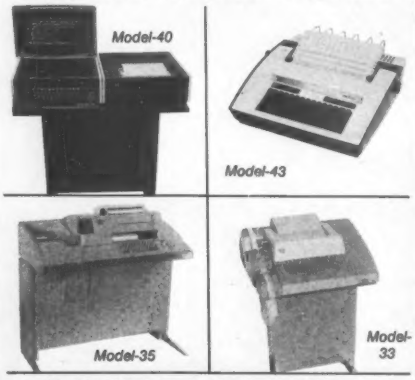

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Tally Cuts Prices

KENT, Wash. — Tally Corp. has reduced the prices for the keyboard send/receive (KSR) and receive-only (RO) versions of its T-1612 teleprinter.

The KSR version was reduced from $2,850 to $2,395, while the RO version costs $2,195, down from $2,645, Tally said. The printers feature 160 char./sec bidirectional printing, 42 programmable functions and communications speeds from 300 bit/sec to 9,600 bit/sec.

Other features include the full Ascii character set, six type sizes and an optional "Quick-Tear" attachment for rapid forms removal, Tally said from 8301 S. 180 St., Kent, Wash. 98031.

Multiplexer Handles 16 Terminals

GOLETA, Calif. — A statistical multiplexer from Comdesign, Inc. reportedly allows 16 asynchronous terminals to communicate over a single phone line.

The TC-5 Terminal Concentrator is compatible with all systems that use asynchronous terminals. The concentrated line uses asynchronous or synchronous communications facilities at speeds from 1,200 bit/sec to 9,600 bit/sec. It includes automatic retransmission to eliminate data errors, Comdesign said.

A front-panel alphanumeric display permits observation of status and programming operating parameters, which can be changed from front-mounted panel controls. The changed parameters can then be saved in a permanent memory, according to the vendor.

Ports can be set at specific communication rates or switched through automatic bit/sec rate recognition. The TC-5 uses X-ON/X-OFF or clear-to-send data flow control for compatibility with most terminals and printers.

The TC-5 can be ordered in 4- to 16-line configurations. Costs start at $1,450, Comdesign said from 340 S. Kellog Ave., Goleta, Calif. 93017.

Clock/Calendar Unveiled

KITCHENER, Ont. — A clock/calendar device designed to communicate the date and time to all computer systems supporting asynchronous traffic is available from Qupro Data Systems Ltd.

The Dataclock 100 can be used to set the real-time clock of a computer system as part of its power-up sequence, a spokesman stated. This was said to eliminate a potential source of human error and be especially useful for systems generating time-stamped transaction summaries.

Software required to support Dataclock 100 can usually be written in a high-level language such as Fortran, Cobol, Basic or Pascal, the spokesman noted. In most cases, he said, operating system changes will not be required.

The clock/calendar device costs $600 (U.S.) from Qupro Data at Suite 200, 501 Krug St., Kitchener, Ontario N2B 1L3 Canada.

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In Telecommunications Industry

American Express Urges Phased Deregulation

By Jay Woodruff
CW Staff

NEW YORK — One of the largest corporate users of telecommunications services in the world has urged a phased deregulation of the telecommunications industry to foster competition, increase user productivity and expand user options.

Deregulation and the competition derived from it "is in the nation's long-run best interest," according to Samuel J. Moss, American Express Co's senior vice-president of corporate systems and communications. Moss presented his views late last month at the Conference on Telecommunications and Productivity, held at New York University's Center for Science and Technology Policy.

Moss believes it is hard to have only a "little" regulation; to deregulate with a minimum of social and economic harm, it will be necessary to do so both gradually and slowly. At stake, he said, is the way we define the national interest concerning telecommunications policy.

"The coming decade will see governments increasingly attempting to arbitrate the trade-offs between the economic benefits and the social cost of advancing technology — among them those related to telecommunications," he continued.

"While it is almost universally recognized that a new regulatory framework is needed," he said, referring to the 46-year-old Communications Act of 1934, "the dilemma for policymakers will be to establish a framework which will serve the best interests of...all the citizens of the U.S."

Americans today would be better served by a "highly competitive" telecommunications industry offering multiple new services, accompanied by the establishment of a market where "open entry and competition are the rule and both monopoly power and regulation [are] sharply curtailed," he said.

The result of all this would be to increase the speed at which "new, more sophisticated consumer premises equipment and data communications networks will likely occur," Moss asserted. While some rates might rise and the quality of some services might decline as the result of deregulation, he predicted that, in general, rates and services would improve.

Privacy Protection

Moss also urged a balance between the need for data protection and the need for corporations and other institutions to be able to satisfy their "legitimate information needs."

"We should encourage technological development for the benefit of all, yet do it in a way that recognizes and ameliorates the public interest problems caused by progress," he recommended, stating further that a "careful and steady approach" will avoid the creation of unnecessary regulatory structures or the imposition of heavy costs. "Where voluntary compliance can sufficiently protect individual rights" he said, "legislation and regulation should not be recommended."

American Express several years ago started its own internal Privacy Code of Conduct, which is also audited internally, Moss stated. This code substantially meets the requirements of the Carter Administration's initiative on privacy.

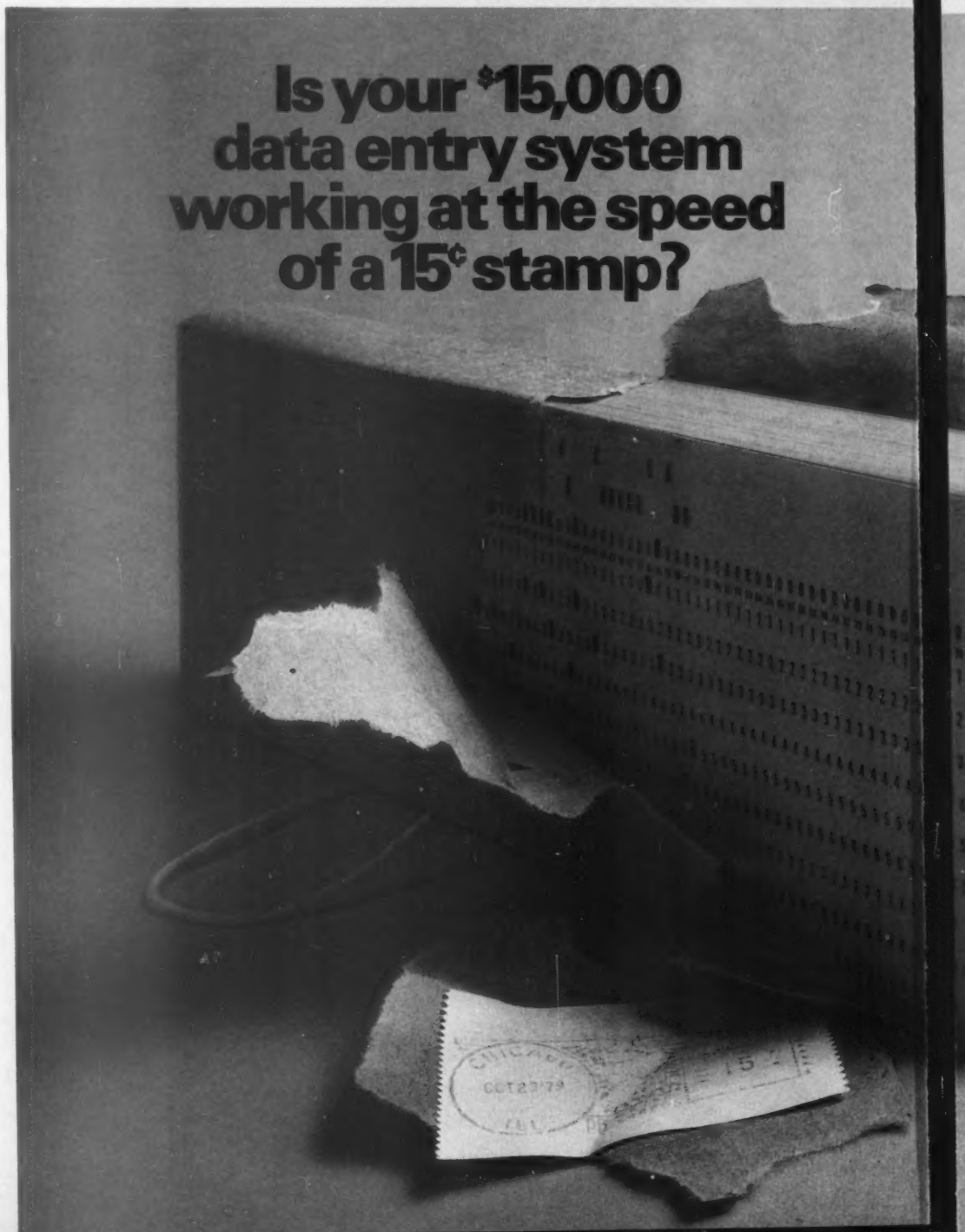
Transborder Data Flow

Turning to the subject of transborder data flow, Moss said international data protection has taken an unsettling turn, especially in less developed countries, which are threatening to regulate and tax information that passes over their borders.

"Other less developed countries are going a step further," he said, "requiring that information-gathering satellites should pay rent for using a country's air space."

Moss reacted to this possi-

(Continued on Page 53)



Packet Net Seminars Set

LOS ANGELES – Communications and control protocol concepts in packet switching will be the subject of a pair of three-day seminars that will be presented in March and April by Technology Transfer Institute (TTI).

The "Data Communications Services and Protocols" seminar, scheduled for March 17-19 in Boston, will provide a working knowledge of various data communications facilities and explain the control structures that manage interconnections in a computer network.

French network pioneer Louis Pouzin will explore applications available for developing and/or using packet-switched communications at the conference in Los Angeles April 28-30. Registration costs $675. TTI is at P.O. Box 49765, Los Angeles, Calif. 90049.

Receive-Only Serial Unit

'No Frills' Teleprinter Introduced

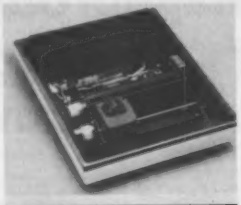
RAMONA, Calif. – A "no-frills" receive-only serial teleprinter for 8.5-in.-wide hard copy is available from Printer Terminal Communications Corp. (PTCC).

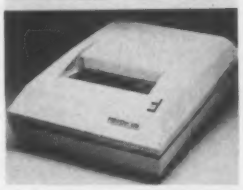
The Printerm Mode 877 printer is a bidirectional 9 by 7 dot matrix printer featuring "a heavy gauge, hardened metal chassis and stainless steel drive screw," a PTCC spokesman said.

The Printerm 877 prints at 120 char./sec, delivering 80 char./line at 10 char./in. with 95-char. Ascii set. Its internally contained paper roll is friction-feed.

Like PTCC's Model 879 printer, the 877 employs the RS-232C serial interface with asynchronous traffic in the 300- to 9,600 bit/sec range.

Weighing about 25 lb., the Model 877 costs $999, or $83 in quantities of 100. PTCC is headquartered at 124 Tenth St., Ramona, Calif. 92065.





The Printerm Model 877 uses a cartridge ribbon to eliminate the need for ribbon-reversing mechanisms.

Moss Urges Deregulation

(Continued from Page 52)

bility as well as other less threatening moves by countries to limit data flow by saying American Express supports laws that protect the privacy of an individual's records, but that neither American Express "nor any other international corporation would be amenable to data transmission shutdowns and unreasonable or arbitrary impediments to the processing and transmission of data."

Moss mentioned that international organizations are now dealing with the problems that are posed by trans-border data flows, and that there is an effort to harmonize data protection laws already passed.

The American Express executive concluded that "those orchestrating the rate of [technological] progress" should be aware that such progress requires social trade-offs. He recommended that technological progress be moderated to avoid "regressive government regulation." "In the long run," he said, "progress will be made only with the support of the citizens and the government."

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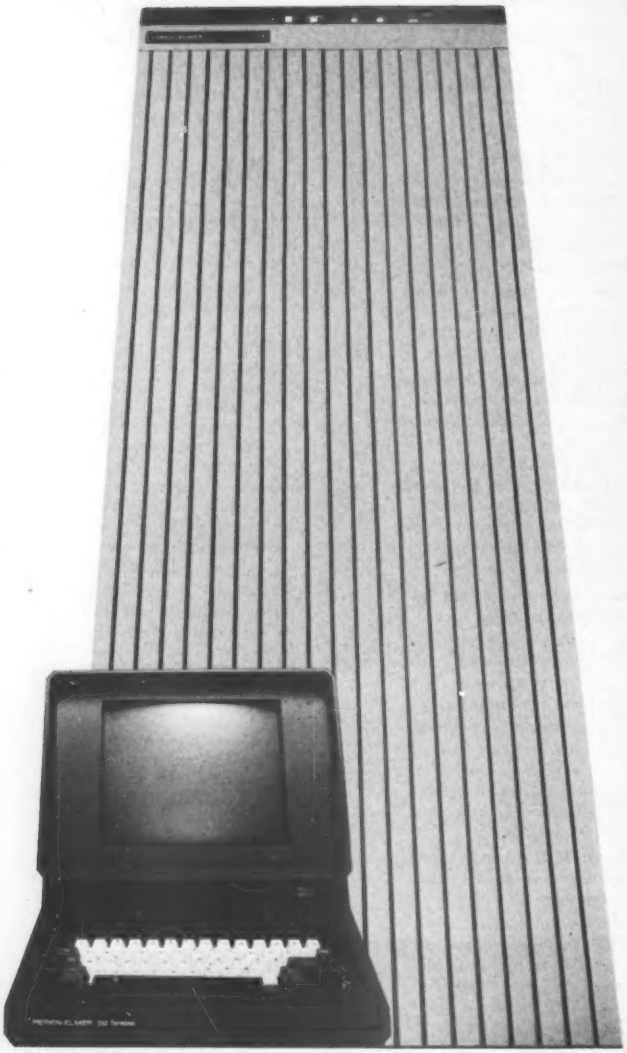

*System prices start at $125,500 (OEM quantity 1) which includes 512 KB of memory, writable control store, floating point processor, battery back-up, Model 550 console terminal, 80 MB disc, and 75 ips/800 cpi tape. Prices are U.S. only.

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Front Ends Fit Burroughs Systems

(Continued from Page 45)
nued. This definition includes a four-character transaction mnemonic; a security-level code; the transaction's mode of operation; the application program number; and the transaction's location within that application program.

With the system, application programs are designed to be independent of "network specifics." The number and type of terminal devices are not critical factors from an application software viewpoint, the spokesman explained.

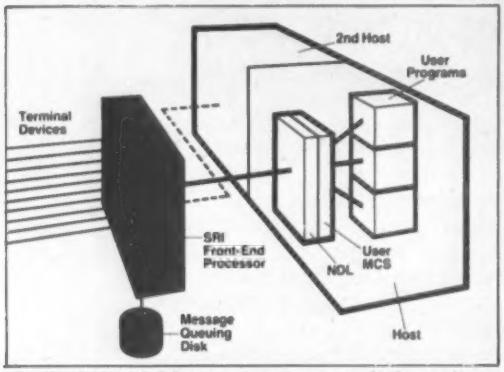
The Model 50 maintains information on the various terminal types in the network and handles control character differences external to the user-written application program, the spokesman said.

System Research's Model 100 system has a combined data rate of 150,000 bit/sec and supports large and active networks while reducing the mainframe resources consumed by Burroughs' NDL, the spokesman claimed.

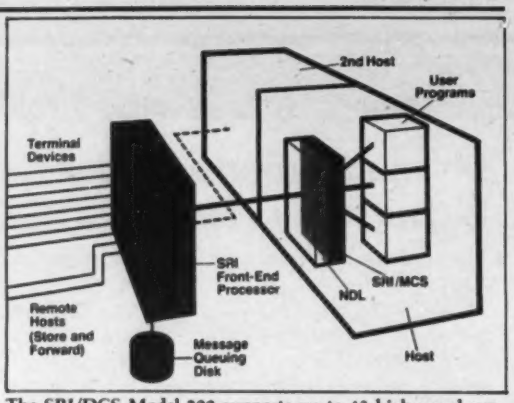
The Model 200 was said to couple the Model 100's front-end processing capabilities with the network management capabilities of the Model 50 host software.

The Model 300 off-loads data communications and message control functions from the host. The series' top performing member can accommodate up to four host mainframes and provides on-line capabilities that eliminate the need for NDL, he asserted.

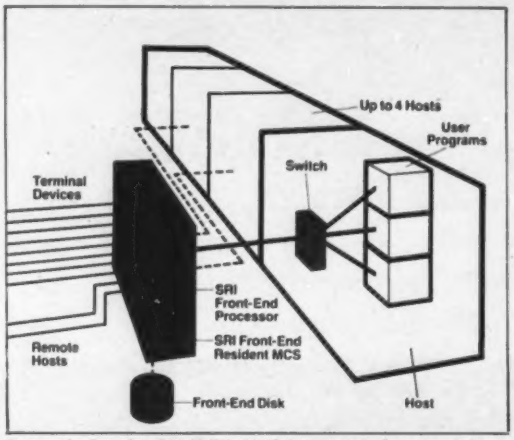
The Model 50, 100, 200 and 300 cost $10,000, $38,750, $48,750 and $72,750, respectively. Systems Research is at 2400 Science Parkway, Okemos, Mich. 48864.



The SRI/DCS Model 100 supports up to 27 high-speed synchronous or asynchronous lines and up to 999 terminals. Like the other members of the series, the Model 100 is based on Hewlett-Packard Co. minicomputer hardware.



The SRI/DCS Model 200 supports up to 43 high-speed synchronous or asynchronous lines, 208 low-speed asynchronous lines or combinations thereof. It may interface two Burroughs medium-scale systems simultaneously.



Protocols for the SRI/DCS Model 300 include several from Burroughs Corp.; NCR Corp.'s Poll-Select; and IBM's bi-synchronous multipoint, point-to-point and 360 and 370 message forwarding.

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Seminar to Explore Local Nets

NEW YORK — Research by the Yankee Group shows that:

- Sixty percent of all business machines communicate within building complexes.
- Twenty percent of business machines communicate within distances of 50 miles.
- Ten percent communicate within distances of 500 miles.
- Only 8% communicate over distances greater than 500 miles.

The significance of this data with implications for the data communications user and vendor will be addressed by a Yankee Group seminar slated for April 16-17 at New York's Harvard Club.

'Fundamental Reality'

Carriers, private branch exchange (PBX) manufacturers and computer vendors have ignored "the fundamental reality of the business communications market," Yankee Group claimed.

This reality was said to be that the data communications market "is *not* primarily interstate or even intercity in nature — it is *local* and *intracity*."

According to the Yankee Group, "vendors who will dominate the market are those whose strategies are developed from the basic premise that hardware and communications are part of a coherent system that must begin with an in-building plan cascading onto a local computer network."

The Cambridge, Mass.-based consulting firm cited Xerox Corp. and Datapoint Corp. as among the few vendors that recognize "the discrepancy between existing 'solutions' and the actual problem."

The seminar will discuss the potential for systems such as Xerox's Ethernet and Datapoint's Attached Resource Computer. But Yankee Group maintained that "the majority of medium and large users will not be willing to undergo the extensive and expensive retrofitting that such systems entail."

Bell's Position

Yankee Group observed that the Bell System "has an inherent advantage and underutilized resource: its intrabuilding wiring." Carriers or terminal vendors that control the building and local nets will control switching, the research firm stated, "and thus control access to intercity [and interstate] networks."

Registration for the seminar costs $650 per person, including meals and texts. Inquiries should be sent to Gwendolyn Thomson at the Yankee Group, Harvard Square, P.O. Box 43, Cambridge, Mass. 02138.

CUE XIV Scheduled

SAN DIEGO — Users of products from Comten, now NCR Corp.'s communications arm, should take note of the 14th meeting of CUE, the Comten users group, slated for April 28 through May 2 in San Diego's Hilton Hotel.

With local computer networks as its theme, CUE XIV will hold sessions on real-time software, network capacity planning and other topics.

Registration costs $150. More information is available from Marilyn Cianciolo, General Motors Research Labs, GM Technical Center, Warren, Mich. 48090.

SURVIVABLE SYSTEMS

Parts 2 and 3: Process Structure And Process Management

We have described the "process' as being the fundamental logical unit of a multiprocessor system from the applications viewpoint. A process is simply a program running in a processor. There are two types of processes: application processes, which perform a portion or all of the application-oriented logic, and I/O processes, each of which is a device handler for a specific device or device group. An application is implemented by a set of appropriate processes that communicate among themselves via interprocess messages.

In order to understand the techniques used to achieve survivability and to be able to analyze and enhance the throughput of a multiprocessor system, we must understand a process in more detail. In this article, we will describe the structure of a process and then explore how it is managed by the operating system.

Process Functions

Since a process is a program, in the classical sense, running in a processor, it has some of the characteristics we naturally associate with programs; that is, it is comprised of a set of instructions, or code, that operates on data. However, at this point several restrictions are placed on the code and data that make a process a subset of what we generally think of as a program. If fact, a process is allowed to do only two things:

- Perform its assigned logical duty

These are the second and third installments in a five-part series.

---

by operating on its own local data (this includes communicating with and controlling its device in the case of an I/O process).

- Exchange interprocess messages with other processes. These messages are used to pass data and control functions from one process to another.

(Under Tandem's Computers, Inc.'s Guardian operating system, a process can also create and stop other processes, obtain current time and do other system-level functions we will consider to be part of its "assigned logical duty.")

A process is specifically not allowed, for instance, to modify its own code, access or manipulate the data of another process or directly interface with a device not under its control as an I/O process.

The structure of a process is shown in Figure 2-1. It comprises three parts:

- A process control block (PCB) which is used by the operating system to schedule and control the process.
- The code which implements the functions of the process.
- The data local to the process upon which the code interacts.

Interprocess Messages

As shown in Figure 2-1, the process is allowed to do only two things in addition to processing its own local data. It may exchange messages with other processes and may make certain calls to routines (not processes) contained within the operating system (these calls are considered part of its assigned logical duty).

Only three types of interprocess messages may be sent by a process:

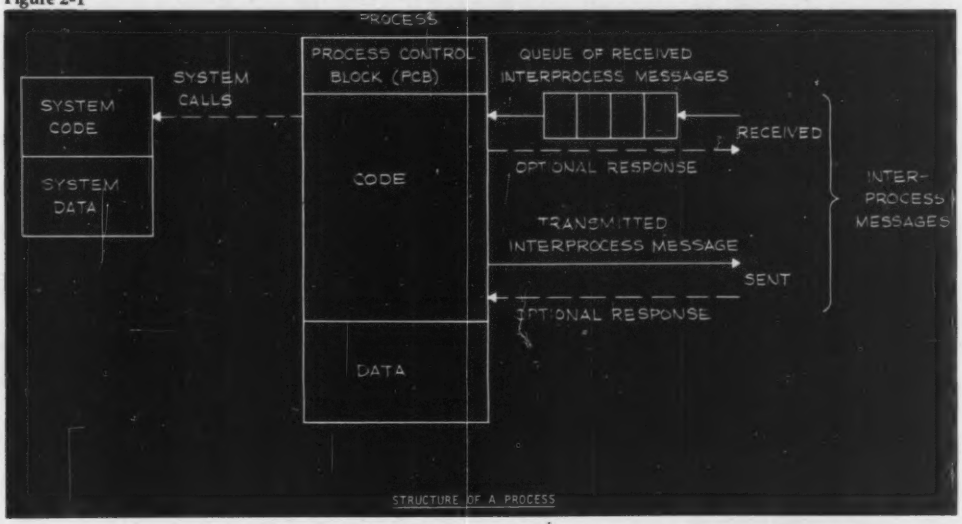
- A message to another application process, perhaps with a response. These messages are used to pass control and data between application processes.
- Read, write and control requests to I/O processes for peripheral device activity. These messages are similar in all respects to messages sent to other application processes.
- Data to its backup process to inform it of its current status, in case a failure should cause the backup to have to take over processing. These "checkpointing" messages will be described later.

The first two message types may be sent by application processes only; as we have said before, they cannot be originated by I/O processes. However, any process — application or I/O — may send a checkpoint message to its backup process; this forms the basis of survivability which will be described later.

In addition to these interprocess messages, a process (application or I/O) may receive messages that ap-

(Continued on In Depth/2)

Figure 2-1



By Wilbur H. Highleyman

IN DEPTH

(Continued from In Depth/1)

pear to be interprocess messages, but are in fact generated by the operating system. These messages are generally status messages concerning situations such as processor down or up events or the stopping or aborting of a process that was created by this process.

As shown in Figure 2-1 (See IN Depth/1), messages sent to a process need not necessarily be processed immediately. Rather, they are queued to the process (via links in the PCB) until the process is ready to read and process them.

This queuing facility will become important in our discussions of survivability, since there is no way for the backup process to know about messages queued but not read by its primary process, nor is there any way for the operating system to know that a message has been read and processed but not answered. Lost and duplicate messages in the event of a takeover are a real concern in multiprocessor survivability considerations, as they are in any communications network.

The system calls a process can make to the operating system generally fall into two classes:

- Calls to routines which are simply common routines supplied by the operating system, but which are really logically part of the process's code. For the most part, these routines implement the transmission and reception of the various types of interprocess messages. They are formally part of the operating system because they use system-level tables and common buffer pools that must be "hidden" from the application programmer.
- Scheduling requests for itself and other processes. A process can request that it be suspended until any one of a set of events occurs (discussed later), or it can request that another process be created or stopped.

Addressing Range

This rather formal structure of a process has an important implication with respect to the size of a process. Particularly in 16-bit machines, the 64K addressing limit sometimes imposes a serious limit on the size of a program. Even with memory mapping between programs, this addressing range must include the program's own code and data, the common data base available to itself and other programs, and that portion of the operating system directly available to the program.

However, in the process structure defined above, there is not a universal requirement that any memory location be available from any other memory location within a process. Specifically:

- The code cannot modify itself. Therefore, a data instruction can access only the data area, and a jump, branch or routine call instruction can refer only to the code area. Thus, code and data spaces are mutually exclusive. A code reference instruction (jump, branch, call) may cover the entire 64K range, as can a data reference instruction. In physical memory, the code and data areas are separate and identifiable.
- A process can access only its own local data area; no addressing range is necessary or allowed to access the data within the local range of another process.
- Tandem takes this one step further in that its processors can distinguish between process code and data areas and system code and data areas.

Therefore, the code of a process can occupy 64K (words, in the case of Tandem, rather than bytes), as can the data (if an address element is a 16-bit word, then typically only the first 32K words, or 64K bytes, of the data area are byte-addressable). Furthermore, the process also has access to 64K words of system code and 64K words of system data. Thus the effective process size has been quadrupled, from 64K words to 256K words, in the case of a 16-bit machine.

Note that in the above discussion, the point has been made that one process does not have direct access to the data of another process. This is not an arbitrary restriction, but is necessary to the fundamental requirement of survivability. It is of paramount importance that the data area of a process not be corrupted by another process that is "sick" because of faulty hardware or software.

If a faulty process had access to the data areas of other processes, it could indeed corrupt those areas and cause a system failure. However, processes have access to the data of other pro-

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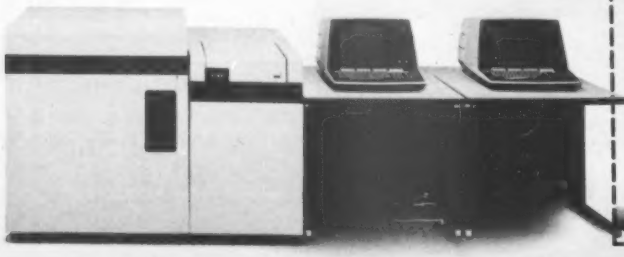

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cesses only through the mechanism of interprocess messages. This gives a process the ability to edit and reject improper accesses to its data area, thus ensuring to any arbitrary extent the integrity of its own data. This is not true of multiprocessor systems that share a common memory.

Process Code Area

For purposes of some of the following discussions, particularly with regard to survivability, it is important to understand in more detail the structure of the code and data areas in a process. The code area comprises a collection of procedures. A procedure is a routine that has an entrance and an exit (or perhaps multiple entrances and exits). One procedure is designated the main procedure. It is given control when the process is first run and has no exit except to stop the process. It "calls" other procedures, which may in turn call other procedures and so on. (Tandem defines another level of subprocedures, which is ignored here.)

When a procedure exits, it returns control to the procedure that called it, at the point in the code following the call. There is no other way for a procedure to exit (short of terminating the process). Figure 2-2 shows a typical code area and its associated data area as processing progresses through several stages.

Process Data Area

The data area is separated into two distinctly different areas — global data and the process stack. The global data is available to all procedures within the process. The stack is used to hold the data that is local to the procedures currently invoked and to control the nesting of those procedures.

There is some similarity between processes and procedures. Just as a process has exclusive access to its data area, a procedure has local data to which it only has access. And just as a process can pass data to another process via an interprocess message, so can a procedure pass data to another procedure when it calls it.

Therefore, a procedure has access to only three types of data:

- The global data of the process, which is accessible by all procedures.
- Its own local data.
- Data passed to it by the procedure that called it.

The Stack

The last two types of data are created in the stack area and then deleted as procedures are entered and exited. Therefore, this data requires addressable memory space only when it is meaningful, that is, when the procedure is invoked; the data simply does not exist when the procedure is not being used.

The use of a stack for procedure data thus brings a degree of efficiency to memory utilization. Figure 2-2 shows an example of stack usage as a process executes. When the process is first created, it is given a data area containing its global data and the local data for the main procedure (since the main procedure always exists, so does its local data); the code and data areas at process creation time are shown in Figure 2-2a.

As the main procedure executes inline code, the data area remains in this configuration. However, when the main procedure decides to call another procedure, it does so by pushing a "procedure data set" onto the stack. The procedure data set comprises all of the data needed by the called procedure and, in fact, is the only data available to that procedure (except of

(Continued on In Depth/6)

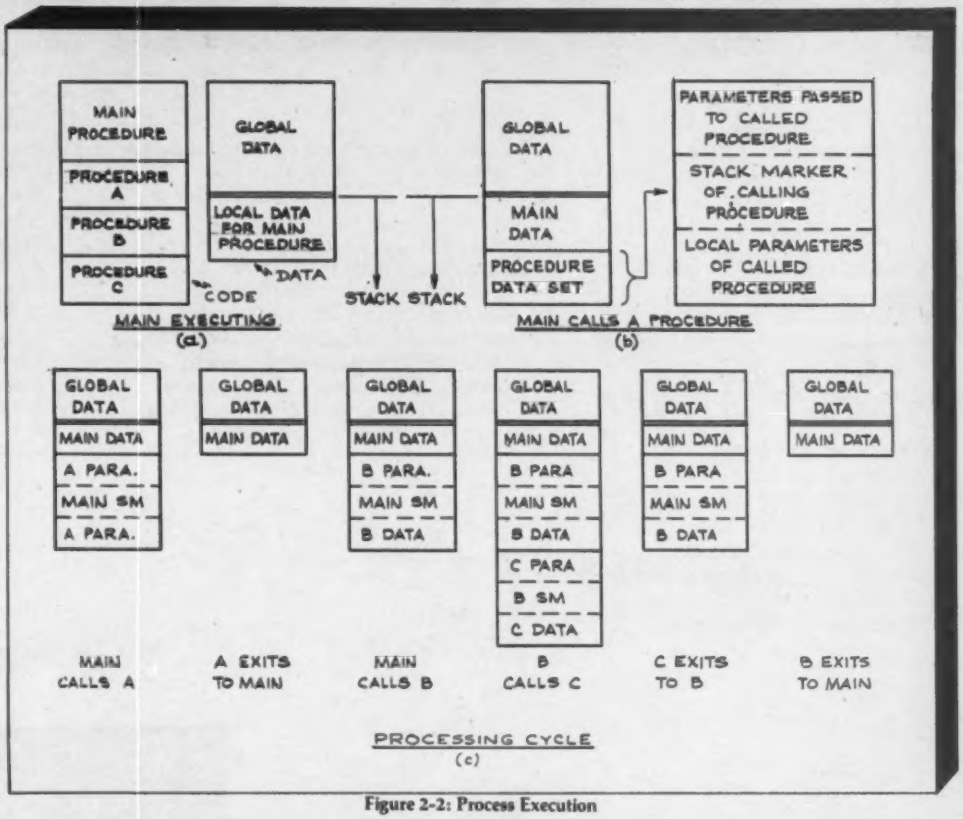

Figure 2-2: Process Execution

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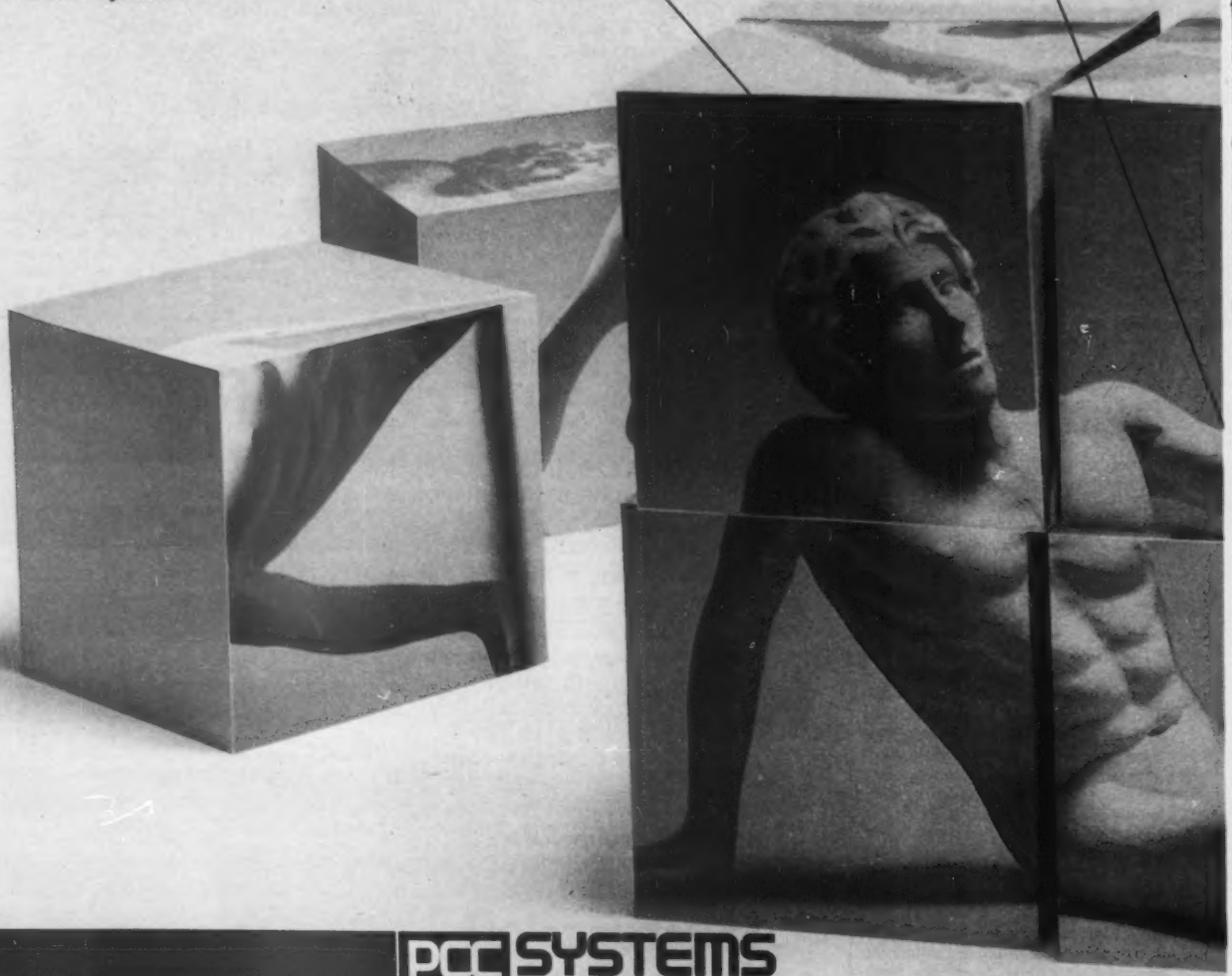

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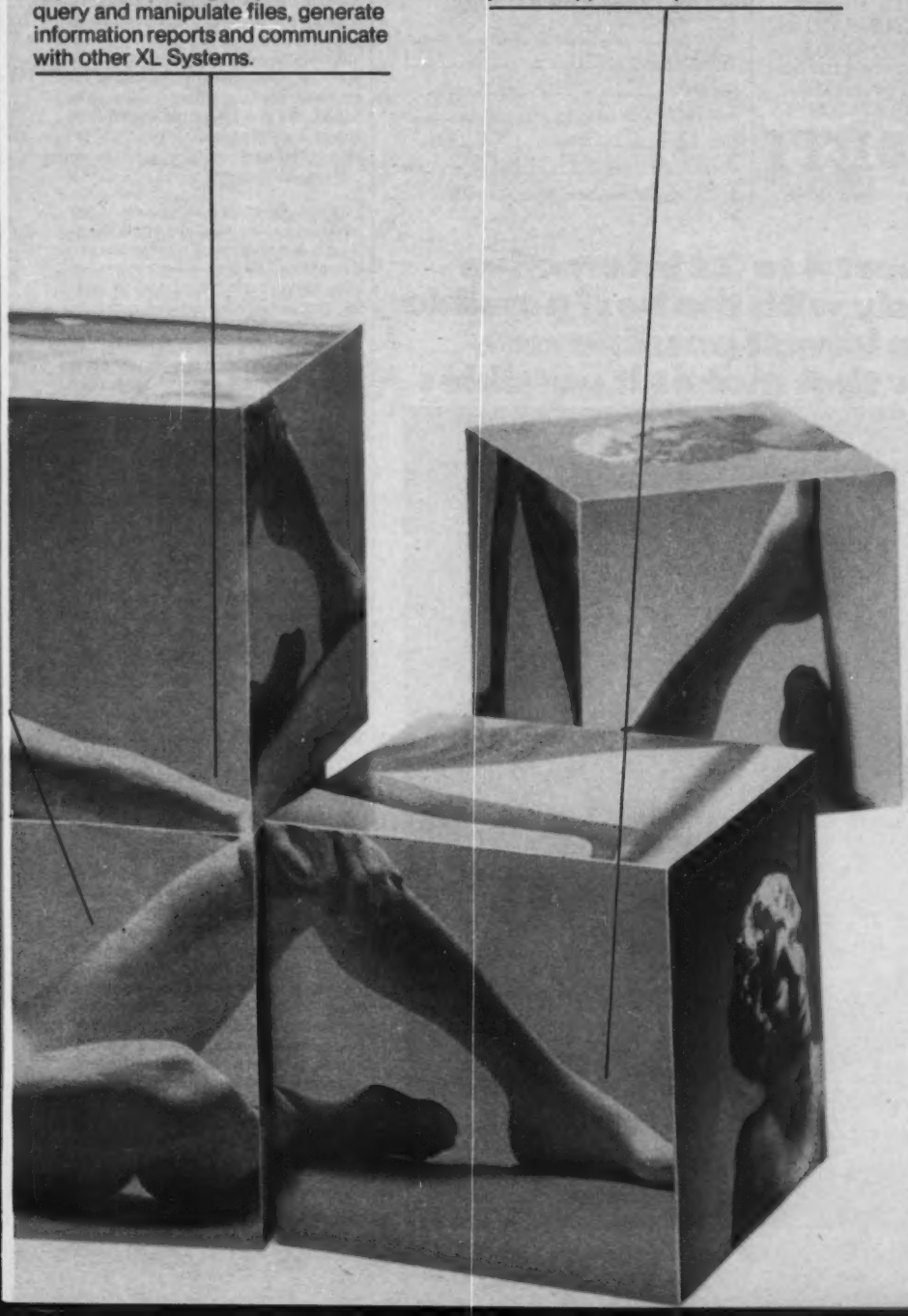

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IN DEPTH

(Continued from In Depth/3)

course that the global data is available to all procedures).

The procedure data set comprises three types of data, as shown in Figure 2-2b:

- The parameters being passed to this procedure by the calling procedure. These parameters can include pointers to data in the global area or pointers to local data of the calling procedure.
- A "stack marker" defining how the procedure is to exit. The stack marker contains the address in the calling procedure to which this procedure is to return (the address following the procedure call) and the machine environment that is to be restored following this procedure's return. (Tandem uses a three-word stack marker.)
- The local data for the called procedure.

The called procedure then executes, operating on the parameters passed to it and the global data pertinent to it. When it has completed, it deletes its data set from the stack and returns to the calling procedure according to the stack marker.

Of course, a procedure can call another procedure, which can call another and so on. In this case, the stack grows, with the nesting of procedures being defined by the sequence of stack markers.

Figure 2-2c shows the stack configuration as the main procedure executes. The main procedure first calls procedure A, which executes and returns. The main procedure then calls procedure B, which in turn calls procedure C. At this point, the stack contains two procedure data sets, one for B and one for C. C then completes, returning to B, which itself completes, returning to the main procedure with a clean stack.

A vital point which will form one of the foundations of our survivability discussion is that the data area with its stack completely defines the state of the process at any instant in its processing cycle. If we were to interrupt a process and then could somehow move its data area as it then stood and its code area to another processor and restart execution at the interrupted instruction (having of course copied the machine environment in terms of memory maps, condition codes and so forth), the process would continue to run as if nothing had happened. More about this later.

Summary

In summary, then, a process is the basic logical entity at the applications level in a multiprocessor system. It can do only two things — perform its own assigned processing functions (including process scheduling) and exchange interprocess messages with other processes. An application process can send interprocess messages to other application processes, to I/O processes and to its own backup. An I/O process can respond to messages received from application processes and can send messages to its own backup. A process comprises a data area and unmodifiable code that implements a series of procedures. The data area contains global data, which is available to all procedures, and a stack. The stack holds all local data pertinent to the procedures currently invoked and controls their nesting. The data area and the current machine environment totally define the current state of the process.

Part 3: Process Management

Having described the process as the basic logical element in a multiprocessor system, and having explored its structure and the way in which it interacts with other processes to implement an application, we must now turn our attention to how this process shares its environment cooperatively with other processes competing for the same resources.

Obviously, in a large multiprocessor system, many things go on simultaneously. Many users perform their various tasks while sitting at many terminals, whisking data around from terminals to disks to printers, while operatorless background tasks may be at work updating data bases, maintaining statistics and doing sundry other tasks. Many processes are active simultaneously

Shared Resources

Processes in one processor generally run independently of processes in

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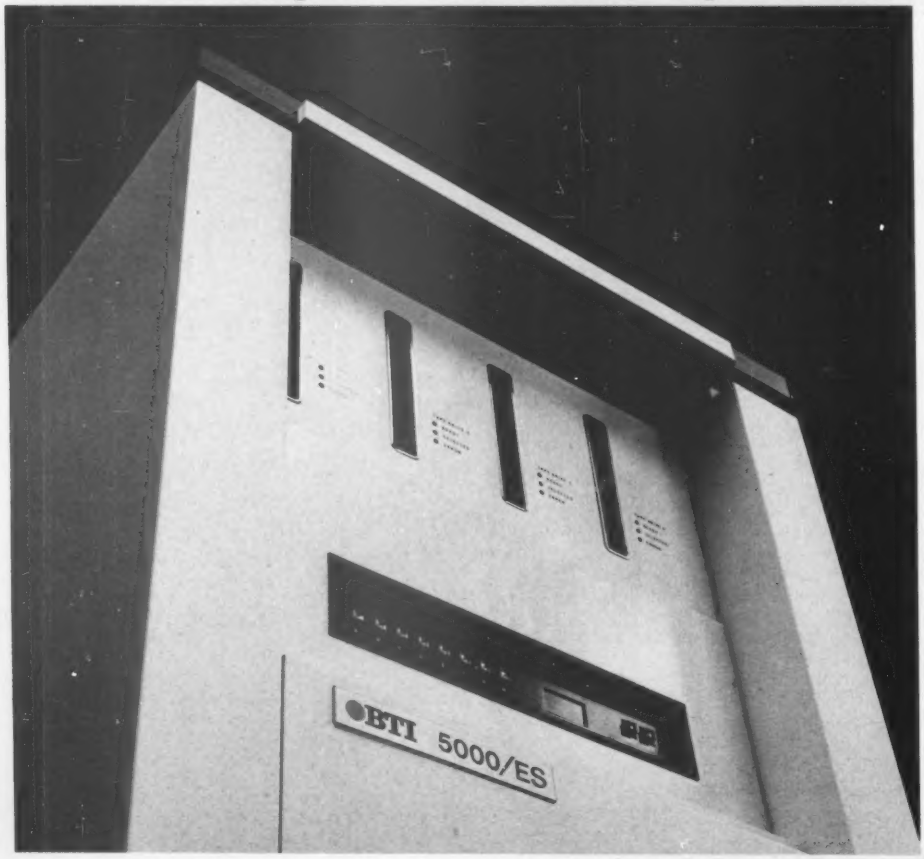

other processors. However, that group of processes assigned to a given processor must share its resources in such a way that all processes may complete their tasks in a timely manner. There are two dominant processor resources to be considered — time and space.

The time resource is processor time. Though it appears to the user that multiple processes are running concurrently in a processor, we know in fact that at any instant only one process is actually running. It will run until it decides to relinquish control of the processor, at which time another process will be given the processor. Therefore, there must be a way to know which processes are awaiting the processor and to transfer control of the processor from one process to another in an orderly and efficient manner; this is called process scheduling. A necessary efficiency in process scheduling is that processes carry priorities and that the highest priority process desiring the processor in fact has it.

The space resource is memory. The sun total of the memory requirements of all the processes that are to run in a given processor could well exceed that processor's memory size. This is particularly true with mobile processes in a multiprocessor system, since we do not necessarily know in advance which processes are going to run where. Therefore, we must have a way to allocate the available memory to those processes currently requiring memory; this is called memory management.

Of course, other resources must be considered, such as disk accesses and file storage capacity. However, these are standard considerations in any application and will not be addressed here.

The functions of process scheduling and memory management in a multiprocessor system do not differ significantly from the way in which they are handled in any one of many modern-day single-processor operating systems, and the reader who is familiar with these operating systems will already understand the concepts to be discussed. However, they are important for our following discussions of survivability and throughput and will therefore be described so that we are all talking the same language.

Process Scheduling

Let us first discuss process scheduling. We assume that several processes have been created in a processor and are currently taking turns running in that processor. A process can be in one of three states:

- **Waiting.** The process is currently idle, but is waiting for one or more events to occur. Until one of these events occurs, there is nothing the process can do, and therefore, it is not a candidate for scheduling. These events may typically be one of three types: 1) the receipt of an interprocess message; 2) a device interrupt signifying an action has been completed and requires process action (for I/O processes only); 3) a time interval specified by the process has elapsed.
- **Ready.** An event has occurred that must be handled by the process. The process is ready to make use of the processor when it is given the chance.
- **Active.** The process is currently the process running in the processor.

(Note that there is no such thing as a dormant process. Once a process is created, it is waiting, ready or active. If it is stopped, it no longer exists. The physical program that was used to create it still exists, but the logical process has disappeared from the system.)

The active process will continue to run and consume all processor time (except for interrupt and cycle-stealing activities which are transparent to it) until one of the following situations occurs:

- It decides it must wait for an event (interprocess message or response, interrupt and/or time interval).
- It decides to stop itself (this is of no further interest to us, since the process is no longer a candidate for scheduling).
- A higher priority process becomes ready.

In the first case (waiting for an event), the process goes into the waiting state. In the second case (termination), the process disappears. In the third case (higher priority process), the process returns to the ready state. In any event, the highest priority ready process, if any, is given control of the processor. This switching of processes

(Continued on In Depth/8)

Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

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A four-point rating scheme was used (1 = poor, 2 = fair, 3 = good, 4 = excellent). The survey results were given as averages of the ratings assigned to each product in each of the five categories.

The Microdata Reality, Basic/Four 400 and System/3 Model 10 and Model 15 were the only small business systems to receive ratings of 3.0 or higher in all five categories.

Taking the average of all five categories, the Microdata Reality topped the field with a score of 3.66 (based on 27 respondents using 55 units). The Reality earned 3.8 in performance, 3.8 in reliability, 4.0 in ease of use, 3.4 in service and 3.3 in support.

Based on nine respondents with nine units, the average for the IBM System/3 Model 15 was 3.6. This system was rated 3.6, 3.8, 3.6, 3.7 and 3.3 in performance, reliability, ease of use, service and support, respectively.

Eight users with 17 Basic/Four 400's gave that system an overall rating of 3.5. In performance, reliability, ease of use, service and support, the system was rated 3.5, 3.4, 3.8, 3.4 and 3.4.

Following this order, the IBM System/3 Model 10 was rated 3.3, 3.5, 3.3, 3.3, and 3.3, respectively, by 34 users with 45 units. The System/3 Model 6 received 3.4, 3.7, 3.7 and 3.1 ratings in performance, reliability, service and support, respectively, by eight users with eight units.

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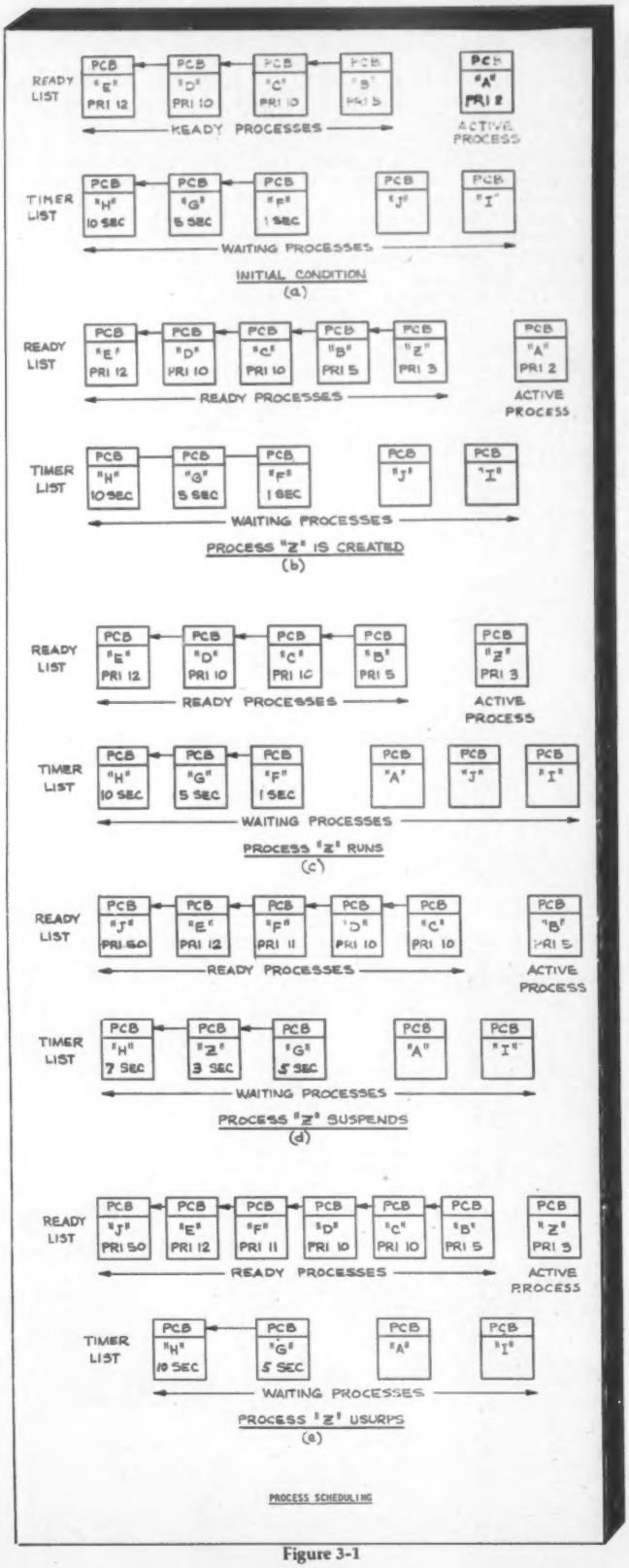

Figure 3-1

(Continued from In Depth/7)
proceeds indefinitely and is the basis of process scheduling within a processor.

Mechanisms for Scheduling

Processor scheduling is handled via two fairly straightforward mechanisms: the ready list and the timer list. The ready list is a list of all processes in the ready state in order of priority (within the same priority, the processes are ordered on a first-come, first-served basis). The timer list is a list of all processes awaiting time-outs, in order of their time-out interval. A process may be on the timer list, on the ready list or on neither. Processes are maintained in a list via links in their PCBs.

Figure 3-1 shows a typical process-scheduling sequence. In Figure 3-1a, 10 created processes are running in a processor, named A through H. Process A is currently the active process; it is the one that is actually running in the processor. Processes B, C, D and E are all ready to run, but are lower priority than Process A (priority 1 is highest to simplify this example; Tandem convention is the opposite). Therefore, they are linked in the ready list via their PCBs, with Process B being at the head of the list since it is the highest priority ready process.

Processes F, G, H, I and J are waiting for some event to occur, and Processes F, G and H are furthermore being controlled by time-outs; for example, if an event does not occur within six seconds, Process G will become ready anyway. (A process can also be simply timing and not waiting for any other event but its own time-out.) Processes F, G and H are linked via their PCBs into the timer list, with Process F being at the head of the list since it has the shortest time-out. Time-out values in the PCBs are incremental values to be added to those ahead of them on the list. Thus, Processes F, G and H are waiting 1, 6 and 16 seconds, respectively.

In Figure 3-1b, Process Z has been created and added by the operating system to the ready list. Since it is higher priority than any other process in the ready list, it is placed at the head of that list.

In Figure 3-1c, Process A has completed and has suspended itself until it receives another event. It is not timing on that event. Process Z, being the highest priority ready process, is removed from the ready list and made the active process.

In Figure 3-1b, Process Z has suspended itself to await an event and has requested an eight-second time-out. It is therefore placed in the waiting state and added to the timer list between processes G and H, which have smaller and greater time-outs, respectively (Process H's timeout is adjusted by A's increment). Note that Process F timed out and has been added to the ready list. Also note that Process J has received an event and has therefore been scheduled by being added to the ready list. Since Process Z is now suspended, Process B is removed from the head of the ready list and made active.

In Figure 3-1e, Process Z has received an event prior to its time-out. It is removed from the timer list, and Process H's time-out is readjusted to include what had been Z's time-out interval. Process Z has a higher priority than the currently active process. Therefore, it is not placed on the ready list; rather, the currently active Process B is returned to the head of the ready and Process Z is made active, thus usurping control of the procesor from Process B; this is called preemptive scheduling.

The foregoing example shows that processes share the processor by simply moving from active to waiting to ready and back to the active state again. Via the time and ready lists and appropriate actions in response to events by the operating system, the current state of each process is known and controlled. Process scheduling gives a processor a multitasking capability since in effect several different tasks may be running concurrently.

Memory Management

Turning now to memory management, the problem is how to stuff five pounds of potatoes into a two-pound bag. Since in a general-purpose multiprocessor system we do not know in advance what processes will be running, much less in which processor, we must be prepared to support a set of processes whose memory requirements exceed the memory availability of the processor in which they are running, perhaps by a wide margin. The requirements of a single process might even be bigger than the memory on its processor.

Paging

The first step in memory management is to realize that all processes cannot fit in memory simultaneously, but somehow the contents of their data areas must be maintained. Therefore, an *image* of the process's data area is created on disk when the process itself is created. (Code areas never change, and their images are already available on disk.) This disk image represents the current contents of all memory locations in the data area that are not currently in the physical memory of the processor.

It is the responsibility of memory management to ensure that if a section of a process's data area is to lose its place in memory to another process, its disk image must first be updated. Since the disk image of a process (code and data) is merely a representation of the true process, which exists only when it is actually in memory, it is called *virtual memory*. By proper management of virtual memory, the processor can be made to appear to have a memory virtually as big as is needed to hold all processes.

Virtual memory is managed via a mechanism known as "page faulting." Physical memory is organized into pages, typically 1K words in size. When a process addresses a word in its

memory (either in its data area or in its code area), the processor (by hardware) ensures that the page containing that word is in fact in memory; if not, obviously, it cannot be accessed.

If the processor finds that the page currently being referenced is not in memory, it generates a "page fault" indication. This means that the processor must bring this page into memory from its disk image before the current process can continue. In order to do that, the processor must select a memory page that it is willing to overwrite with the new process page (note that every memory page contains valid code or data from some process or another).

The algorithm used to select a page for destruction varies from system to system, but is generally based on two considerations:

- **Age.** When was this page last referenced? Pages whose contents have not been used for a while are considered dormant and candidates for overwriting.
- **Modification.** "Dirty" pages are data (never code) that has been modified since it was last read in from its disk image. If a dirty page is to be overwritten, it must first be written out to update its disk image, whereas a clean page does not. Clean pages therefore have priority over dirty pages as candidates for overwriting.

Once the processor has selected a page for overwriting, it will write it to its disk image if it is dirty (has been modified) and will then read in to that same physical page in memory the process page being accessed. At this point, the process may continue.

Though virtual memory significantly expands the capabilities of a processor, it must be emphasized that page faulting is an extremely hazardous event with respect to system performance. It can virtually stall a processor if allowed to get out of hand. When a page fault occurs, not much else can go on in the system. Certainly another page fault cannot be honored until the first has been processed. Otherwise, one could find so many page faults in progress that when one page fault completed, it had already been reseized by a later request (an extreme but possible scenario). Therefore, during page faulting, the processor becomes very limited in what it does and may stall, thus drastically reducing its throughput.

To alleviate this, one can "fix" part o: all of the code or data of critical processes into physical memory. These pages are never subject to paging. They will always be in memory when needed, but reduce the amount of memory available for paging.

One of the obvious characteristics of virtual memory as described above is that one never knows what physical page in memory currently contains a particular logical page of a process. In fact, a logical process page migrates randomly through physical memory as page faulting occurs. Sometimes it is there, and sometimes it isn't. And whenever it disappears, it pops up somewhere else.

Keeping track of which logical page is currently in which physical page is called "memory mapping." Like page faulting, it is largely a hardware-supported function, since it must be performed on the fly with instruction execution.

To accomplish this, the processor has two hardware memory maps, one for the code area and one for the data area, that can be loaded by software and then used by the hardware as a process executes. The contents of a memory map are illustrated in Figure 3-2 on In Depth/10.

Likewise, each process has a code

(Continued on In Depth/10)

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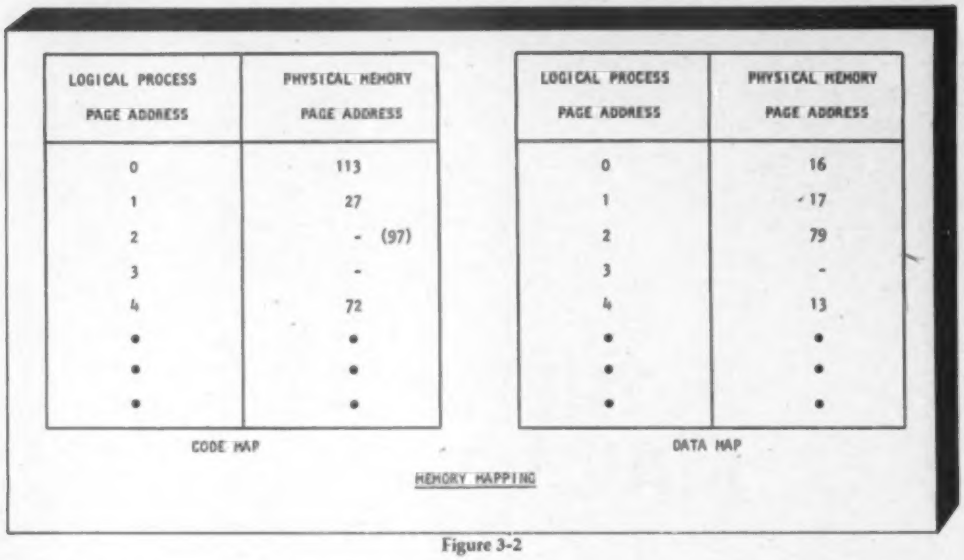


LOGICAL PROCESS PAGE ADDRESS	PHYSICAL MEMORY PAGE ADDRESS
0	113
1	27
2	- (97)
3	-
4	72
•	•
•	•
•	•

CODE MAP

LOGICAL PROCESS PAGE ADDRESS	PHYSICAL MEMORY PAGE ADDRESS
0	16
1	17
2	79
3	-
4	13
•	•
•	•
•	•

DATA MAP

MEMORY MAPPING

Figure 3-2

(Continued from In Depth/9)

map and a data map associated with it. When it is running, its maps are loaded into the processor's hardware maps.

Let us say that the example of Figure 3-2 shows the maps for the currently running process and that the process is currently executing code in its first logical page (Page 0). This code is found in physical Page 113 of the processor, and the processor is then executing code located in Page 113.

If the process's code execution falls through to Page 1, or branches to Page 4, execution proceeds normally since these pages are in physical memory. However, if it should attempt to execute an instruction in its logical Page 2, the processor will find that that page is not currently in physical memory. It will page fault, find an old page to overwrite (say physical Page 97) and will read the current process's logical Page 2 into physical Page 97, after writing the old page to its disk image if it was dirty. Any maps referencing the old contents of physical Page 97 must be modified to show that that logical page is no longer in physical memory. The process may now proceed to execute code in its logical Page 2 (physical Page 97).

A similar scenario holds for data page accesses. In the example of Figure 3-2, data accesses to logical Pages 0, 1, 2 or 4 will be executed normally. A data access to Page 3 will cause a page fault.

Note that under memory mapping, the code or data area of a process is not necessarily (and probably is not) mapped into contiguous physical memory. Though memory space appears logically to be contiguous to the user, it is in fact spread quite randomly throughout physical memory.

We have described separate memory maps for code and data areas, since these areas are totally exclusive and may each range over the entire address space (64K in a 16-bit machine). As we discussed earlier, Tandem expands this by distinguishing between user (application) space and system space. The Tandem processor therefore has four maps — user code and data and system code and data.

Managing Multiple Users

One additional fallout from the Guardian-type operating system should be noted. As we have said, a process is a program running in a processor and comprises a code area and a data area. The code area is never modified. There is no reason another process could not be created in that same processor, using the same program but simply carrying another name. In fact, since its code area will be identical to that of the first process, the code area would not have to be duplicated; both processes would map into the same code area in physical memory, as shown in Figure 3-3.

Let us introduce one more concept, that of the "home terminal." When a process is created by an operator, it is created by that operator typing in a command (a RUN command, in the case of Guardian) at a terminal. The process then knows that terminal as its home terminal and may refer to it as such.

Consider a program written to perform a task (maybe an inquiry task) to support one and only one terminal, which is its home terminal. The program file is stored as an object file on disk named INQ.

One operator could walk up to terminal 1 (in Figure 3-3) and type (in Guardian format):

```
RUN INQ / NAME $INQA /
```

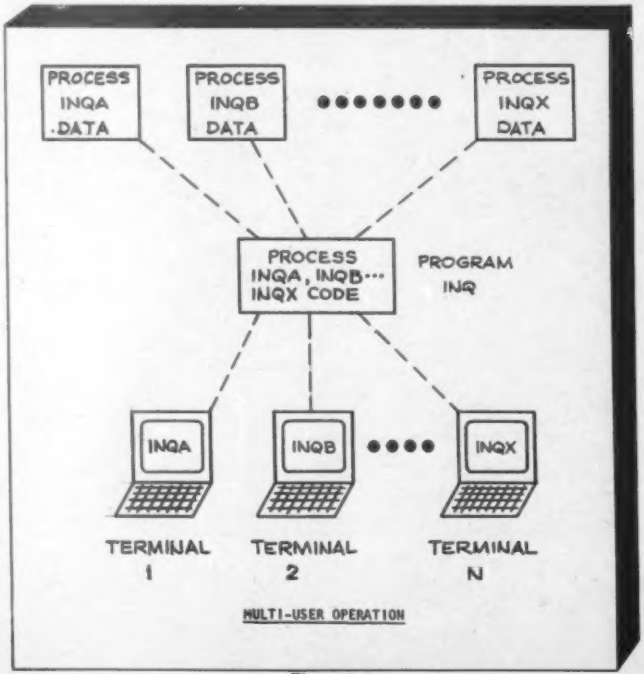
and the process INQA would be created. A copy of the code corresponding to program INQ would be made available to process INQA, and a data area image for process INQA would be created on disk. The operator can now use process INQA for inquiry purposes. As the process executes, pages required by it will be paged in and mapped as previously described.

A second operator can walk up to terminal 2 and enter a similar command:

```
RUN INQ / NAME $INQB /
```

and process INQB will be created as for INQB, except that a second copy of INQ's code does not need to be paged into physical memory if INQB is running in the same processor as INQA (that is, the terminals are on the same processor, or the CPU is specified in the RUN command); process INQB will use the same code area as INQA.

This can continue virtually without limit, allowing more and more simultaneous users of the same single-user program by creating more and more uniquely named processes using the same program. All such processes running in a common processor will use a common memory-resident copy of the code. In fact, the sum total of memory used by many single-user processes is about the same as the memory used by one large multiuser process since the separate data areas are required anyway. The duplication of common data areas is perhaps offset by the simpler code required.



MULTI-USER OPERATION

Figure 3-3

Additional Considerations

The creation of a large number of processes does not come without problems, and there are some instances in which it is desirable to design a process to handle a number of users. Among these considerations are:

- Each process requires a PCB which is allocated from very valuable common buffer space in the system data area (under Guardian, a PCB requires about 50 words). This imposes a practical limit on the number of processes that can exist in one processor at any one time.
- If large buffers are required for each user, n users will require n buffers if each process is single user. This could result in excessive page faulting, a topic which will be dealt with in a forthcoming part. A multiuser process could get by with a smaller buffer pool which it dynamically allocates to users as needed, so page faulting would be reduced or eliminated.
- Interprocess messages, as we will see later, are time consuming. In some applications, it is possible to batch

(Continued on In Depth/12)

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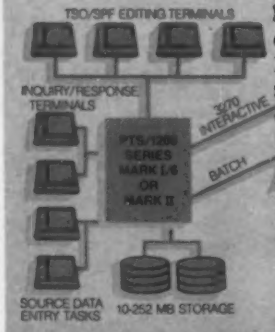

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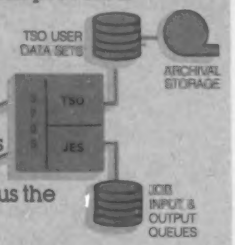

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IN DEPTH

(Continued from In Depth/10)

transactions in one process before sending them to another process, thus saving many interprocess messages. In this case, it may be desirable to have a process control many users so it can accumulate a batch in a relatively short period of time. Otherwise, data base updating and other functions dependent on these transactions might drag.

• The act of process switching adds operating system overhead. When processes are switched, the old active process must be switched to waiting and perhaps added to the timer list, the new active process must be removed from the ready list and maps must be switched. A single-user process must be switched after every transaction; a multiuser process need be switched only when it has processed all transactions pending from all its users.

These descriptions of processes and process management have brought us full circle with respect to our goal of simple software development. Let us look at what this type of operating system allows us to do.

A programmer can write a program designed to support a single user and, with virtually no additional effort, find that he has:

• A multiuser program, one that can be used by many users simultaneously.

• A program that will run in a multitasking environment (that is, many other tasks may be running concurrently).

• A program that will run on a processor regardless of the amount of memory it requires or the amount of memory available to that processor.

• A program that will run in a multiprocessor environment in which he can be unaware of the particular processor he will be using or to which processors his various peripheral devices are connected.

Thus, the problem of writing multiuser, multitasking, multiprocessor programs has been reduced to the writing of a single-thread, single-user program — the simplest possible. We have achieved the goal we sought — software simplicity in a multiprocessor system.

Unfortunately, this has not come without penalty. The penalty is in system capacity, because of the high overhead of this do-all operating system. But this is the trade-off we will be willing to make as hardware costs go down and software costs go up — more hardware for less software. The critical subject of system capacity, throughput and responsiveness will be considered in a forthcoming part.

Next week: Survivability.

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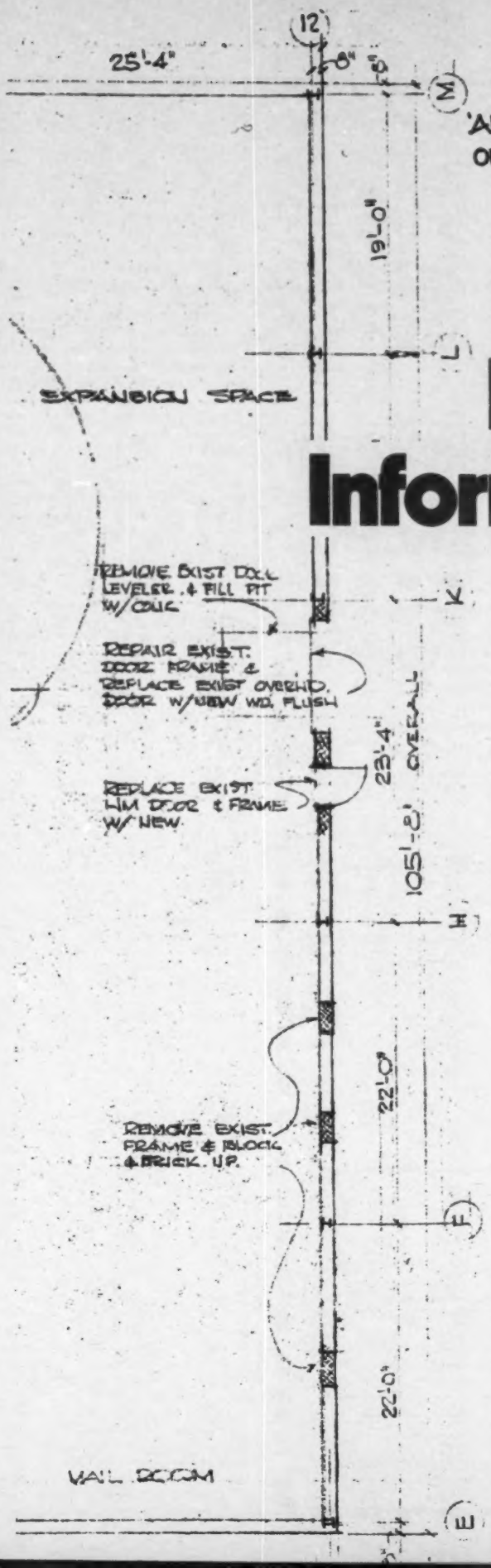
Dr. Wilbur H. Highleyman is president of Sombers Associates, Inc., Mountain Lakes, N.J., a firm specializing in minicomputer and microprocessor turnkey software. He is also chairman of MiniData Services, Inc., a service company.

Previously, Highleyman was responsible for Data Phone development at Bell Telephone Laboratories and was a cofounder of Data Trends, Inc. He has been instrumental in the design and implementation of survivable systems for the graphic arts, communications, financial and wagering industries.

Highleyman holds a B.E.E. degree from Rensselaer Polytechnic Institute, an S.M.E.E. degree from Massachusetts Polytechnic Institute and a D.E.E. degree from the Polytechnic Institute of Brooklyn. He holds four patents and has published extensively on pattern recognition, communications and business minicomputers.



'ARCHITECTED' DATA AND HIGHER LEVELS OF NETWORK PROTOCOLS ARE THE KEYS TO THE OFFICE OF THE FUTURE...

A Blueprint For Tomorrow's Information Systems

By James C. Mosher

Today's information systems managers, DP managers, administrative managers, communications managers, records managers, systems designers and others are confronted with the problem of information structure: how to develop a plan that will optimize information processing, content, storage and flow within the organization.

The content of this plan can take several forms. Distributed information processing with a variety of types of DP and office equipment, electronic document distribution, electronic files, micrographic storage and other facilities can be considered. The objective is to improve the productivity of secretaries, administrative personnel, managers and professionals while at the same time improving the way business is conducted. The plan may or may not reduce short-term costs, but it should demonstrate cost improvements over a reasonable period of time.

Ideally, this plan should address not only establishment or enterprise requirements but other enterprises, and consideration should be given to electronic information interchange with government organizations. It would save time and effort tomorrow if today's systems could be designed to communicate with other organizations directly or through electronic postal services in a standardized way. These postal services could be provided by the U.S. Postal Service, authorized corporations or other organizations.

Even though such a broad planning effort is not possible today, we shall examine the problem further and address possible solutions.

Today's Office Equipment

Information processing equipment available today can provide immediate costs savings and/or added value in the functions performed for most all organizations. Word processing systems are no longer restricted to the task of processing words. In addition to providing sophisticated word processing functions, they merge data with text, process files (lists), sort files, perform mathematical functions, provide easy-to-use forms fill-in functions, generate output of photocomposition devices, accept input from optical character recognition (OCR) devices and communicate with each other or with other computers. Yes, they are computers.

The significant difference between word processors and what we traditionally think of as computers is that word processor manufacturers have generally placed heavy emphasis on human factors in the design of both the physical characteristics of word processors and the logic driving them in an attempt to provide products that are easy to use with minimal training. In addition, word processors, in terms of total number installed, generally do not involve user programming (as programmers know programming), although this is changing – note the introduction of the OIS/Basic Integrated Office System from Wang Laboratories, Inc. In addition, CPT Corp. announced the availability of CompuPak on the CPT8000. This feature will allow Basic, Fortran and Cobol programs from independent suppliers to run on the 8000 with minor modifications. Datapoint Corp., Digital Equipment Corp., Vector Graphics, Inc. and others also offer one or more programming languages in conjunction with the text-editing features of their products.

The introduction of the IBM 6670 information distributor and the Wang image printer have placed product types between word processing and data processing. The 6670 can accept input from magnetic cards produced by operators on magnetic card typewriters or input produced by computer programs and sent as a data stream over communications links. The print quality is good and several fonts may be produced on the same page. Computer printouts can be condensed onto letter-size paper. This type of product is also a copier as well as a local or remote printer. The IBM 6640 ink-jet printer can also accept input from magnetic cards or communications links.

OCR equipment may play a signifi-

(Continued on In Depth/14)

IN DEPTH

(Continued from In Depth/13)

cant role in capturing text. Typewriter-created text may be input to either word processors or computers for subsequent text editing. Hard-copy documents from existing files may be placed on-line via OCR, indexes created by an operator at a terminal and the documents kept on-line or transferred to micrographic storage through computer output microfilm (COM). The material can be made available for subsequent retrieval via computer-assisted retrieval (CAR).

CAR enables each microfilm viewer/printer to be used more efficiently, improving the productivity of the operator and of the individuals requesting hard copy. The placement of a minicomputer in a microfilm viewer/printer, as in the Eastman Kodak Co. IMT-100 and IMT-150 microimage terminals, enables a host computer to download the specific cartridge and the specific frames on the cartridge for which hard copy is desired. The host program can sort hard copy requests by cartridge and frame, eliminating redundant operator access to cartridges and improving frame search time.

Facsimile devices, while initially providing the impetus for electronic document distribution in a stand-alone mode, are now beginning to reach a point where they can be integrated into a document distribution system. Digital encoding techniques, coupled with some form of character recognition for address information, will open the door to more effective utilization of these devices.

Communications technology, as viewed by some observers, is ready to integrate this equipment as well as other information processing devices already present in the DP environment. Today's communications protocols and network architectures are reaching a point where they are stable, more adaptable to sophisticated error-recovery procedures than their predecessors and functionally complete for many of today's applications. Networks are being installed with these protocols and architectures as the fundamental building blocks for tomorrow's systems. But what about the rest of the blocks that comprise the information flow in a distributed information processing system?

Need for Standards

While there are many problems to solve before any one organization can develop and implement an information plan that approximates what some would call the "office of the future," two major technical problems remain to be resolved before industry and government become too enamored with today's products and subsequently entangled in a web of problems that constrain their plans and options:

1. Standards are needed to define the structure of information for tomorrow's information processing products.

2. Standards must be established for higher levels of communications protocols for tomorrow's distributed information processing systems.

This does not mean industry and government should stop in their tracks and wait for these standards. As the foregoing discusssion indicates, today's products solve many productivity and distributed information processing problems. Most all major computer manufacturers, and many smaller manufacturers, provide distributed processing solutions for many of today's DP problems.

Office automation or combined office automation and DP solutions are also available. The Wang Inter-System Exchange (Wise), a form of distributed information processing for the office, was introduced by Wang at the beginning of 1979 as part of its Office Information System (OIS). Wang also introduced Mailway for electronic document distribution. In November, IBM announced the 5520 administrative system, which provides electronic document distribution and text-processing functions. Datapoint announced the Integrated Electronic Office, which contains an electronic message system, dispersed data processing, word processing and communications management facilities.

Computer manufacturers and software houses are announcing more and more host programming packages that provide more office functions for DP-based systems. But tomorrow's products and systems should be based on more formal and extensive data struc-

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tures and higher levels of communications protocols.

Problem of Structured Information

The manufacturers of today's information processing equipment have attacked a specific set of user problems and have come up with solutions for the problem set; however, the solutions fall short because the problem set did not include the notion of a system. In many instances, solutions are offered that go beyond one equipment type and interface to other equipment types or computers. For example, OCR devices are offered with a variety of features and options as to how documents will be viewed by the receiving process. How should I attach the device to my mainframe? How much programming will be involved to attach it with one set of options versus another set of options?

But when an OCR device is offered as an optional attachment to a specific word processor or computer in conjunction with a specific software package, many of the option choices and problems disappear. The word processor or computer manufacturer has already decided how the OCR device should be attached and what the documents should look like (document format) when sent from the OCR device to the receiving process.

Word processors have evolved from typewriter technology and offer a variety of functions expressed in terms familiar to the operator: tab set/clear, indent tab, left margin, right margin, backspace to delete a character, backspace to overstrike a character, change type style or language or both and so forth.

When documents are printed from word processor storage, the logic driving the printer understands the internal data constructs for many of these external functions. Some functions are executed immediately when the data is entered and, therefore, the logic driving the printer never encounters these functions as data constructs. For example, backspace to delete a character and type another character would not be present in storage — the new character replaced to old character in storage on data entry. But, word underscore to underline a word, indent tab for a temporary left margin or change type style (to mention a few constructs) would be present in storage as data constructs.

This all sounds simple enough. However, the problem is with these very data constructs. Each word processing manufacturer has, out of necessity, developed a private set of data constructs to represent the desired external functions. It is true, however, that there are de facto standards for some data constructs because IBM word processing products were first on the scene.

Word processors that read and write IBM-compatible magnetic cards provide some interchange of data. Some word processors provide only upward interchange of data on magnetic cards — they read but do not write magnetic cards. But how many word processors can process data from a diskette produced by another manufacturer's word processor, even if it is physically the same type and has the same recording density, or receive and process this same data over communications lines? In general, word processors from different manufacturers cannot talk to each other without a product or service acting as an interpreter (data transformer) between these internal foreign languages.

The IBM 6670 Information Distributor operates on commands coded in the Operator Control Languages (OCL). OCL is used to describe the format of the text and actions to be performed as the text is processed or printed — for example, a change from Courier 12 pitch to script 12 pitch in the middle of a document or printing on both sides of the paper. OCL is not only an external language used by operators to invoke the desired functions, but it is also the language expected over communications links. Word processing operators may or may not find OCL hard to learn, depending on the desired functions, but programmers who may be required to write programs to generate this OCL may more than just raise their eyebrows when first confronted with this language.

The IBM 6640 ink-jet printer also supports this language on magnetic cards or over communications lines. An interesting anomaly is that the IBM OS/6 word processor does not under-

(Continued on In Depth/16)

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IN DEPTH

(Continued from In Depth/15)
stand this OCL on magnetic cards but does understand OCL if received over communications lines.

Origin of Constructs

Historically, the designers of computer-based text editors were forced to invest language constructs to express many text functions because the terminals supported were data entry devices and not word processors. For example, instead of a "word underscore" key on the keyboard of a word processor, a language construct for this function is specified by the operator on a data entry device. Language constructs are also embedded in the text, presented to the operator through a view port or on hard copy prior to the final printout, creating interesting training opportunitites for the entry and revision operators as well as considerable training costs. (Word processors generally avoid or minimize this problem by highlighting the character or position, or by using some other visual technique, where a format change is specified. Moving the cursor under the highlighted character will cause the format information to be viewed elsewhere on the display, thus maintaining the presentation accuracy of the text.)

We could elaborate further on the problem, but it suffices to say that today, when we build information systems that contain a variety of word processors, data entry terminals, graphics terminals, information distributors, printers of all kinds, OCR devices, photocomposition devices and computer-based text editors, we are confronted with more sophisticated data transforms (more and more programming). We immediately realize that there is no common internal data structure for these products. Most all of these products support communications and communicate, but they all speak different languages.

Single-sourcing these products from one manufacturer will solve part of the problem, but it is not enough. It only delays the moment in time when a system or a specific information processing product from one manufacturer must comunicate with a system or product from another manufacturer.

Toward a Solution

The only acceptable solution to this problem is to attack it head-on just as those individuals who developed Cobol did more than 20 years ago. We require an architecture for the data structure of tomorrow's systems that will become a standard for tomorrow's products. It is true there are standards committees, national and international, thrashing out many aspects of this problem. Excellent progress has been made in the development of proposed solutions, but these efforts must be intensified and perhaps involve more business, government and other users of tomorrow's systems. At the very least, potential business and government users should participate in developing requirements for future systems.

While it would be highly desirable to develop standards for the external presentation of functions to users, it may not be practical. Such standards would place unnecessary restrictions on the manufacturers of information processing equipment and on the users of this equipment. For example, one product manufacturer might specify a menu on a CRT for the desired functions and options, another might specify special keys on a keyboard and another could specify a group of functions for a single key. Language constructs instead of additional keys on the keyboard may be provided for additional functions. But even here, excessive training costs for multivendored products may dictate a standard for some of the very basic functions.

In all cases, however, the data stream sent from a device to a system, from one system to another, from a system to a device or from device to device would be common in structure regardless of the external manner in which a product manufacturer desires to manifest these functions.

The emphasis is on a common data structure. Supporting a common data structure does not imply support of all of the data constructs within that structure. For example, a document containing a data construct defining italics in the middle of a document would be handled properly by an information distributor without operator intervention. Changing the type wheel

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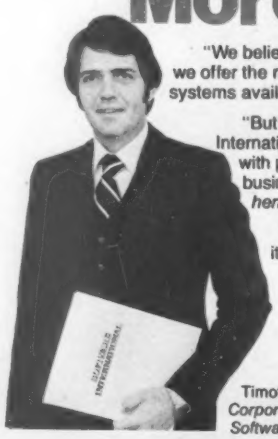

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on a daisy wheel printer for a type style change to italics may not be viewed as important; at least the information is correct, if not the emphasis. The daisy wheel printer would ignore and not choke on the data construct defining a type style change. Of course, a two-headed daisy wheel printer could print the italics, assuming the proper type wheel were mounted on the second print head.

Consider as another example a document in English with one paragraph in German. An information distributor could print this document with no operator intervention. A single-head daisy wheel printer (or the processor controlling the printer) could be instructed to exercise one of several options, such as the following, when it encounters a data construct defining a change in language:

- Stop and ask the operator to mount the proper wheel (attended operation).
- Print a warning message and continue.
- Print a warning message, stop printing the document and:

a) Reschedule the document for printing on a printer configured to receive such documents.

b) Place the document in a queue of documents not printed, place a message in the specified (configured) operator's message log.

However, if the data structure included the definition of the attributes of the data stream preceding the actual data, we would avoid the mess described above half way into the document. The specified processing would occur prior to processing the document; for example, the document would be immediately rescheduled for printing elsewhere or the operator would be warned that language or type-style changes will occur in the document about to be printed.

Additional Structure

The data structure could be further structured by product type or product class and defined by levels of support within product class, perhaps in a manner similar to the groups for facsimile devices established by the Consultative Committee on International Telegraph and Telephone (CCITT). For example, Group 1 for a word processor would support document formats (left margin, tab rack and so forth only at the beginning of a document. Group 2 would support format changes, such as type-style change, within a document. Group 3 would support Group 1 and Group 2 plus additional format changes. Multilingual documents would be supported by Group 4.

Each group could be divided even further by subgroup (or more group numbers could be assigned). A subgroup number could denote the specific data type and the mandatory and optional data constructs supported within the data type.

Product type or class and levels of support would also be defined for today's products. We still want to send messages or documents described with a limited set of code points for characters and very few code points describing data presentation.

This data structure should be flexible enough to allow new data constructs to be added as new requirements develop, yet rigid enough to be understood by product developers. Some observers will view these statements regarding a standard data structure as just another way of stating the need for creating and standardizing virtual terminals for all types of information processing equipment, which is true to some extent.

Others might point out that what we are really after here is another computer language or an extension to an existing language, that a standardized data structure can actually be embodied in a rigidly defined language.

This may also be true as long as the object code, to use a traditional term, of this language is rigidly defined in terms of structure and is the format used for intermachine communications.

As much as we may (or may not) dislike bits, bits are unambiguous and are efficiently processed by computers. This is not an argument against languages for people. However, how many of us could, or should, agree that OCL, Script/370, Generalized Markup Language or other external languages for text or graphics — or subsets of these languages — define the proper syntax for intermachine communica-

(Continued on In Depth/18)

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IN DEPTH

(Continued from In Depth/17)
tions? This is not to suggest that we prohibit the shipment of data containing these external language constructs in networks or stop any effort to standardize these types of languages.

Others may view the definition of a common data structure as an attempt to define something far too complex to be worth the effort. But things become complex only when they are not rigidly defined to begin with, when they are not defined within the context of a well defined structure and when they are developed as bottom-up solutions to a set of specific problems.

This standards effort could provide a framework for equipment manufacturers and users. Product class and group numbers support would be provided when a product is announced, so system designers and integrators would have more specifics about the attach capabilities of a product and more product choices to deal with when selecting equipment based on requirements.

We have discussed the first of the two major problems to be solved for tomorrow's systems. As we move toward interconnecting networks developed by different manufacturers, governments and other organizations, the second major problem must be considered.

Network Protocols

The network protocols in many systems today perform the requirements for sending information from one computer to another or from one device to another, regardless of the number of intermediate nodes in the network. However, more information must be conveyed in a structured manner to describe not only the attributes of the data being sent or received, but also a series of other attributes, optional and standard, that convey additional information about the data and the type of processing to be performed on the data. For example, the additional information could specify a document as "personal." "Return receipt requested" could be specified as an action to be taken by the receiving device or node controlling the receiving device (logging the document name, originator name and name of the recipient who must acknowledge the request).

Store-and-Forward Systems

Information describing the data and actions to be performed is especially significant in store-and-forward electronic document distribution systems. With such systems, there may be no single controlling host. The originating device (or operator) may not know the product class or level of support for the receiving devices or when a document will be available for delivery to the receiving devices. Information must be added to the data stream at the point of origin (by the device itself or the node controlling the device) to ensure an understanding of the data stream by the receiving devices or nodes controlling the receiving devices.

It would seem unreasonable to determine routing paths for all recipients of a document at the point of origin, or node controlling the point of origin, because of the cost and coordination problems associated with maintaining directories of all potential recipients of documents at the point of origin. In addition, performance problems may be associated with inquiries to a central directory for routing information. If we think of area code and telephone number, as an example, we immediately realize that multipart addressing is required if this protocol is to be applicable to large enterprises or to interenterprise or national information interchange. Multipart addressing is common to many networks today and is, therefore, no surprise.

It is sometimes difficult to develop notions of addresses in a higher level protocol without affecting lower levels of the communications protocol. However, if we assume a distributed information system with no controlling host, only routing paths for node names should be required in the nodes of the network — again, nothing new. The second part (and optionally more parts for some processes) can be resolved by the higher level protocol in the target node. This resolution can, optionally, take several forms known only to the receiving node — the address is actually the name of a distribution list of addresses or the address is

(Continued on In Depth/22)

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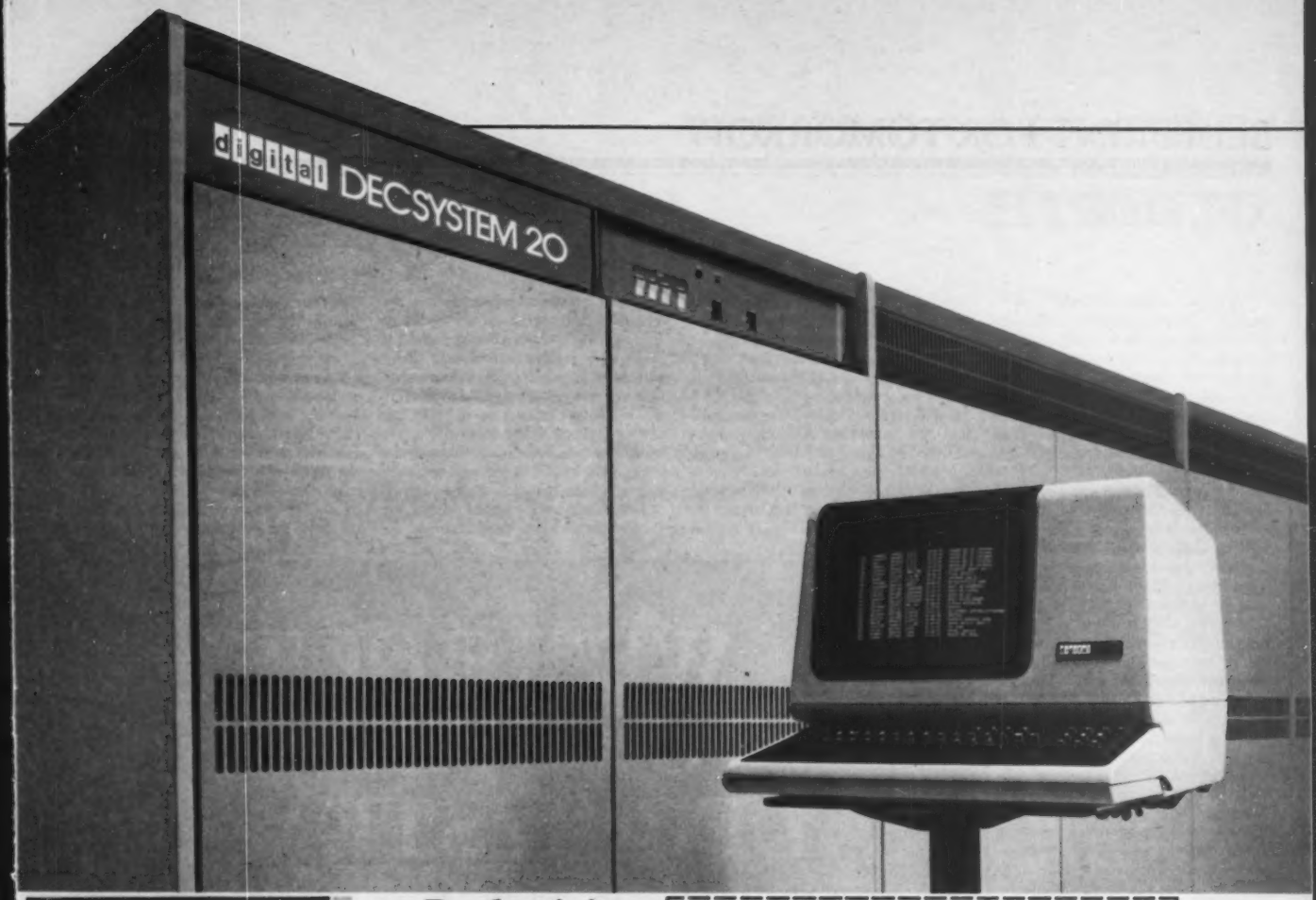

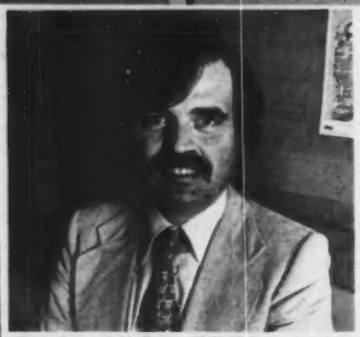

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(Continued from In Depth/18)
the name of a device, the name of a file or something else understood locally to the node. (Remember the guy you terminated; you changed the meaning of his symbolic delivery address from a specific terminal to the dead letter file without any configuration changes in the nodes of the network except your own node.)

Another aspect of store-and-forward systems is the deferred validation of the correctness of the address except the node identification. The document originator need not immediately know an incorrect address was specified. It could be an hour or a day before the error notification is returned to the originator. Requests for interactive sessions or other functions requiring immediate contact with the addressee (person or process) would require immediate address validation, that is, establishing immediate contact with the remote device or process.

The protocol should allow multiple addresses to be specified for a single information unit. For example, if a document is sent to 10 individuals on a carbon copy list and all 10 are associated with the same remote node, only one copy of the document should be sent to that remote node. Similarly, if all 10 individuals are intended to receive documents at a common mail room device, the procedure could be to send from the controlling node only one copy of the document to the device. The device, which has storage for reasonably large documents, could produce the 10 copies. This device could be an information distributor or a word processor. For a device with limited or no storage, the mail room clerk could make multiple copies off-line, as instructed by a cover sheet sent with the document listing the specific individuals who are to receive the document at that location.

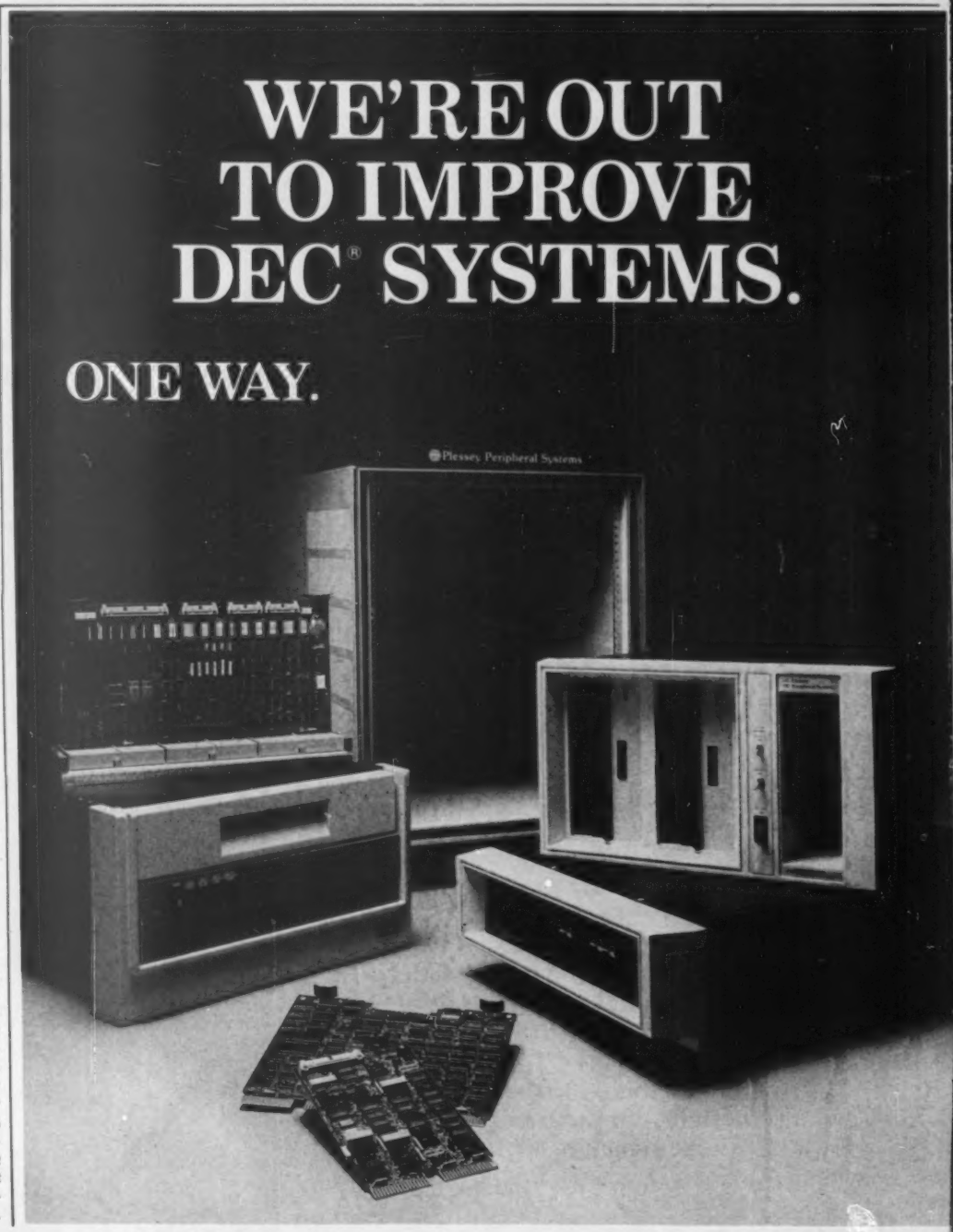
Is this design overkill? Probably so for messages or short memos, but frequent shipment of long memos or large documents to multiple recipients attached to the same node quickly justifies what at first appears to be unjustified for the resultant savings in communications costs. In addition, consider the short memo to all managers in all operating units within the establishment. Why not take advantage of the multiple-copy feature of the word processor or information distributor?

Other Data Types

The specification of product type or class, and data type based on group or subgroup numbers, should permit known digital data types to be part of the structure. Data attributes for each data type would further describe the data in the data portion of the information unit. For example, the horizontal and vertical picture element density and the presence or absence of gray scale information for facsimile data could be specified. Attribute information could be present for the entire data portion of the information unit such as a document or could be optionally present on a subunit (page) basis. For facsimile, picture element density could vary on a page-by-page basis; for example, the cover letter and charts within the document are sent with a much higher resolution than the bulk of the document.

If data type specifies voice information and immediate delivery, we may simply be logging control or accounting information for a telephone conversation between two individuals, and this protocol level may never see the digital voice data. If data type is voice information and immediate delivery is not specified, we could be transmitting a voice message and the processing is identical to text documents — it proceeds in a store-and-forward manner from node to node in the network. Immediate delivery for text or data could denote an interactive session between a terminal user and a program or a session between two programs in the network.

Other data attributes could further qualify the ultimate destination of the information. For example, the specification of "personal document" for a document received at the office would cause the document to be printed on the quiet thermal printer in the recipient's office or scheduled for viewing at a display in the recipient's office. Nonpersonal documents would be directed to the device controlled by the recipient's secretary or to the local mail room device(s). With the merger of digital voice and data, the address could be further resolved to a specific



telephone or terminal based on data type.

The following is a very preliminary list of items that could be considered to describe and control the data in the information unit. The list is obviously incomplete, and no attempt is made to address required or optional items in the list or to state the presence or absence of items based on data type.

- Originating device or process.
  - a) Manufacturer ID.
  - b) Group number.
  - c) Subgroup number.
  - d) Version number (microcode, software and engineering levels).
- Delivery information.
  - a) Class of delivery (immediate, first class, second class and so forth).
  - b) Personal document.
  - c) Message for receiving operator and/or recipient.
  - d) Response due date.
  - e) Return receipt requested.
- Information for filing, responding, requesting information, creating various reports or logging.
  - a) Document name.
  - b) Originator name/address.
  - c) Author name.
  - d) Subject.
  - e) References.
  - f) Creation date.
  - g) Time and date sent.
  - h) Time and date received.
- Document attributes for text.
  - a) Size of first logical page.
  - b) Initial language.
  - c) Initial type style.
  - d) Initial tab positions.
  - c) Initial line spacing.
- Desired presentation characteristics.
  - a) Size of first physical page.
  - b) Quality output or draft output.
  - c) Number of copies.
  - d) Offset multiple copies in the output stacker.
  - e) Duplex (print on both sides of the paper).
- Overlay for text.
  - a) Signature or other handwritten information.
  - b) Photograph.
  - c) Chart or diagram.
  - d) Presentation coordinates.
- Document attributes for facsimile.
  - a) Horizontal picture element density.
  - b) Vertical picture element density.
  - c) Gray scale.
  - d) Size of logical page.
  - c) Characteristics of intrapage white space.
- The actual information (text, data, data file, program, facsimile, audio and so forth).

Commands

We have not addressed commands and command options or modifiers. At a minimum, the protocol should define requests to send and acknowledge receipt of information. It could be extended to include everything one could think of as a command or instruction to be carried out by the receiving process, but it could delay the definition of this protocol forever if we took this approach. It would seem more reasonable to define yet other architectures, public and private, that further structure the data portion of the information unit. For example, we could send a unit of information in which the data portion is defined to be an information retrieval request. Once we agree on a structure, we can then proceed to sort out what is agreed to be public and private in terms of architectures.

Information Security

Information security must be a major consideration with this higher level protocol. The encryption facilities should allow information to be encrypted between the originating device and the receiving device regardless of the number of intermediate nodes in a network. This form of encryption was termed "end-to-end encryption" in the Special Report article, "Cryptography Provides Practical Data Security," by Carl H. Meyer, Richard Lennon and Stephen M. Matyas [CW, Nov. 26] and "end-to-end encipherment" by Professor Harry Katzan, Jr., in *The Standard Data Encryption Algorithm*, Petrocelli Books, Inc., 1977. End-to-end encipherment for interactive person-to-process or person-to-person sessions must be available to those individuals or organizations requiring a high degree of information security.

With store-and-forward operations, the data portion of the information unit must not exist as a deciphered entity on auxiliary storage of any node in

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IN DEPTH

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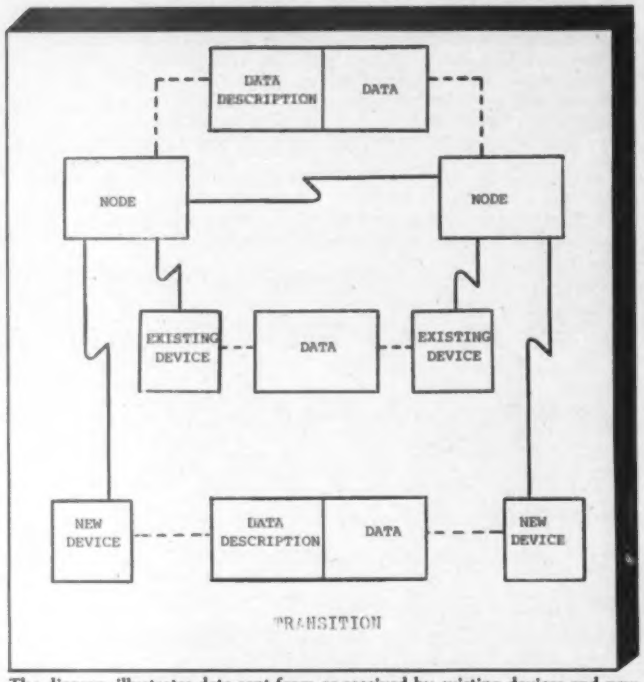
the network including the node controlling the receiving device. Consideration must be given to the fact that it could be days or weeks before a recipient looks at his mail. This does, however, present interesting system problems in the management of cipher keys.

The originator of a document should have the option of specifying a document password if encryption is not used or not available to some devices because it is not cost-justified. In addition to the usual validation procedures for terminal identification and user identification, the recipient would be required to enter the originator-assigned document password before receiving the specific document associated with the password.

Store-and-forward operations require control information for tracking down lost documents or pinpointing other errors not handled by the lower protocol levels. As network ownership of a document proceeds from one node to the next in the network, the receiving node should acknowledge receipt to the sending node. The receiving node should also acknowledge receipt of a document by logging appropriate information. The sending node could also log delivery information. This is analogous to transferring a document from one post office center to the next appropriate center or to the recipient.

Networks for postal or other public services dictate standards for this control information, as well as standards for information content, format, when logging should occur and the criteria for control information retention and destruction. Our users and the general public are already tired of hearing "it's the computer's fault" as an explanation for many of the frustrating experiences encountered with today's business and government applications. Can you imagine the outcry if tomorrow's systems are not properly planned?



The diagram illustrates data sent from or received by existing devices and new devices. Nodes controlling existing devices (devices that do not support the data description) would add the appropriate data description to the data before sending the information unit on to another node and strip off the data description before sending the data to an existing device.

Network Protocol Independence

It may be unrealistic to state that this higher protocol level should be independent of existing and planned network protocols. However, it should be a design objective. This protocol should serve both communications and cabled attachment of information processing equipment. What is described here is the need to standardize the envelope containing the data — a method of identifying and coding within the envelope the characteristics of the data — and to begin to develop standards that define the actual data structure. This envelope should permit the description of existing data structures as well as data structures for tomorrow's products.

This approach obviously will not eliminate the need for data transform modules in network nodes or end-user information processing devices. However, it could provide a uniform framework for understanding data source and type and provide clearly understood interfaces for both equipment manufacturers and users.

Whether you agree or disagree with the technical views expressed here is not important. The point is to emphasize the need for a more intensive national, and ideally international, effort to get our arms around these problems and develop solutions. The alternative is to lie back and let things happen. And, while this is exactly what may happen, we must recognize that more and more programmers would be required to patch up the mess. This would seem wonderful for programmers, but one wonders about the nation's productivity to which lip service is so often given.

Standards will be necessary for tomorrow's systems regardless of who may provide the services embodied in these standards. Standards exist for electrical specifications, modem controls and plugs. Link-level protocols are either standardized or reaching a point where technical incompatibilities are disappearing or the protocols can be modified to talk to each other. This should be the case for the bit-oriented protocols, High-Level Data Link Control, Synchronous Data Link Control, the Advanced Data Communications Control Procedures and perhaps others. Work is under way to resolve and standardize the functional and procedural exchange of data and other network-level functions.

This is not to understate the many problems to be solved before different networks can exchange data. They may never exchange data without appropriate bridges, and some of these bridges may be impossible to define. Yes, we are working our way up from the bottom. But is it not time to also start from the top down?

James C. Mosher is president of Texas Information Systems Corp., a consulting firm in Austin, Texas.

Mosher has 24 years of information systems experience, including 15 years with IBM. At IBM, he was a senior programmer in office systems architecture with the Office Products and General Systems divisions and was one of several senior programmers assigned to the architecture of the IBM 5220 administrative system. He was also responsible for technical and managerial assignments in the programming development of IBM operating systems and participated in the design and development of VS1, VS2, MVT and MFT.

Mosher is a graduate of Fairleigh Dickinson University.

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SOFTWARE PORTABILITY!

By Charles H. Frye

Soaring program development costs are prompting a second look at portable software. A federally-funded portability project scored some successes but also uncovered problems in the dissemination, installation and use of portable software.

Software portability received a lot of attention during the late 1950s when problem-oriented languages first began to appear on the scene. Professional meetings invariably offered one or more sessions on the subject. Several of the large software houses experimented with numerous methods for writing portable programs. Then the topic sort of died. Only a handful of articles have appeared on the subject in the past 15 years or so. However, software portability is a subject whose time must eventually come.

Sal Razza's excellent article on software portability [CW, Nov. 19] gave us a status report on a few such projects and some of the methods being used to solve the problems. He also cited some figures which lead one to the inevitable conclusion that software production is becoming too expensive for programs to be simply tossed out with obsolete machines. He rightly concluded that, without the necessary profit incentive, computer manufacturers could hardly have been expected to promote software portability.

And neither the federal government nor the large software houses have much interest in it, at least not until recently. Now, however, program development costs are forcing us to take another look at the prospect of writing portable software.

This article discusses one portable software project that has been in progress since it received initial National Science Foundation (NSF) support in 1968. The purpose of the project was to develop a portable version of a computer-assisted instructional software system known as Programming Language for Interactive Teaching (Planit). The system was subsequently developed with NSF funding and has since been extensively tested by the U.S. Army Research Institute (ARI) to establish the validity of its portability.

Successful Results

The testing conducted by the Army has established Planit's portability even beyond the forecasts in the original proposal to NSF. Planit is a full time-sharing system with language features for authoring, editing and executing lesson scenarios as well as providing a Basic-like interactive calculation facility that is available to author, lesson and learner alike. Planit interacts with all the usual computer peripherals; performs its own file management with appropriate levels of protection; accepts authors, learners and experimenters in any mix; provides automatic data recording and session linkages for learners; and incorporates extensive error recovery to minimize data loss resulting from hardware malfunctions and so forth. In short, Planit is a sophisticated time-shared software system that was particularly designed for instructional use. And it is portable.

Planit's Portability

Planit was designed to be portable. It was written in a language which was especially designed to make it portable. During installation (conversion from one computer to the next), Planit is preprocessed into source code that is acceptable to the target computer. That source code has usually been Fortran, although languages other than Fortran have also been used. This method of installation was chosen in order to profit from optimizations the local compilers perform for the computers in which they operate.

It is not the intent of this article to describe in any detail how the portability was achieved. However, the solution is not complicated. It was just a matter of solving each of the problems, one at a time, such as those involving collation sequences, data allocations, character codes, word and byte sizes, language syntax variations and the like.

Portability was achieved through two primary means: preprocessing the source code in the context of several descriptive parameters, the assigned values of which determine the format of the source code which is then submitted to the target machine's compiler, and an elaborate set of table-driven data structures that cause Planit to run virtually the same on every computer. Installation also includes some local coding of an I/O interface routine, a task that can normally be accomplished in a week or two.

Original development of Planit happened to occur on a Xerox Data Systems XDS 940 and an IBM 360/40, although neither machine influenced the design of the software. Since that time, the system has been installed on one or more models of computers from nearly every major manufacturer. These have included several minicomputers as well as a large selection of mainframes.

In every case, Planit was installed from the one master set of source files, and in every case, it executes virtually the same. It has run as a small, single-user version and has also been benchmarked with an excess of 200 interactive terminals. It has run successfully on several machines that were not even in existence in 1968 when the project began. ARI has documented several successful validation projects regarding Planit's portability, so it is safe to say that this method works for this particular application at last.

Related Problems

So far, this discussion has dealt more with successes than with problems, and the reason for that will soon become apparent. Actually, the problems are not directly related to achieving the software portability. Although much time and effort have been expended, that aspect of the project has gone rather well.

Rather, the problems addressed in this article pertain to the dissemination, installation and use of portable software. These are problems that have been a part of the Planit experience and will likely confront most other developers of portable software as well.

1. Personnel. Finding competent, productive computer programmers who could work on the Planit system source code has been a challenge. Those programmers who helped conceptualize the method in the early days of the project were a great asset, probably in part because they grew with the system. However, programmers who entered later were faced with methods that were foreign to them.

Experienced programmers produced good code, but they invariably ran into trouble making it portable. Twelve or

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IN DEPTH

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more weeks of intensive training were required before their code would transport reliably. On the other hand, inexperienced programmers could more easily be trained to write portable code but, as expected, their code was inferior to that from the veterans.

Unfortunately, the mentality of today's programmer typically asks only that the finished code run properly on the computer that happens to be in use. Coders of portable software will need to be trained to meet standards that their programs run properly on nearly any machine.

By the same token, the debugging of portable software is a greater challenge since it involves at least two levels of error detection: errors in the program logic itself, as evidenced on the current computer, and errors affecting portability, which only become apparent on a different computer. Developers of such software will need access to dissimilar hardware, or at least will need to develop sophisticated diagnostic programs that check for portability errors.

2. Hardware Generalist Requirements. Most programmers identify themselves with one kind of computer or at most two or three. However, the programmer of portable software will often be faced with equipment he has never seen before. Installation will usually require the combined efforts of the one who wrote the portable software and one who is knowledgeable about the machine on which it is being installed.

This kind of team effort requires precise communication and division of labor in a way not now generally practiced. Or it requires that the programmer of portable software become sufficiently familiar with a large number of computers so that the services of a resident expert are not needed. Since this level of hardware generalization will rarely be found in programmers, a discipline for an effective team approach will probably need to be developed.

In several installation experiences with Planit, communication problems have repeatedly surfaced between those familiar with Planit software and those familiar with the machine. On the Planit side, the person often does not comprehend the full impact of the system interface procedures being proposed to implement the various I/O requirements, and on the computer hardware side, the systems person tends to have a tried and true way of doing things without due regard for the fact that it might not fully satisfy the function that Planit has already been coded to expect. In several instances, effective communication between the two team members did not begin until after the first attempt revealed that Planit failed to perform properly.

3. System Integrity. The problem has been one of the most serious for the Planit effort. It is manifest primarily in two ways: incomplete (or incorrect) installations and less-than-optimal installations.

As a point of reference, note that most software is developed on and for a particular computer. If that software is running at more than one site, it will be on the same or a similar kind of computer and can reasonably be expected to perform as well. Poor performance can ordinarily be readily attributed to insufficient core memory, slow disk drives and so forth. However, the program itself is probably going to execute predictably.

With portable software such as Planit, performance can be drastically affected by the manner in which it was installed. One characteristic of good portable procedures is that the software is robust; that is, it will execute correctly in a variety of environments. Unfortunately, that same characteristic will also permit execution that produces correct results but in a most inefficient manner.

Planit installations have been observed to be reading massive numbers of overlays from disks unnecessarily, which piled overhead on top of overhead in the movement of messages between the computer and its terminals and made seldom-used modules core-resident or often-used modules reside on disk — or both. Some installers have improvised local procedures in place of things Planit would already do for them, had they learned how to use its facilities. In several instances, rather than implement a particular Planit installation requirement, they simply made a convenient substitu-

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tion, trusting that the users would not exercise the feature. The following are some of the more flagrant occurrences:

- Overlays were being read from disk prior to determining whether they were needed. Excess disk reads were occurring by the dozens each minute.
- Large error-recovery routines were made core-resident even though these routines might only be used once a week or less.
- The entire Planit system for all users was made to pause whenever a tape was being mounted.
- Time slicing was deactivated, allowing users to dominate the computer.
- A horn was caused to sound on the terminal to prompt each typed response because the installer wanted to output a known character to implement a "Write then Read" sequence.
- A program STOP was coded into a branch point of an I/O routine the installer chose not to implement, causing the entire Planit system to halt if any user invoked that function.
- Multiple copies of Planit were installed under a host time-sharing system where each copy accessed the one common set of Planit system disk files, defeating Planit's file protection and substituting none other in its place.
- Absolutely nothing was done in response to some particular Planit I/O request, returning execution to Planit as though the operation had been done and hoping for the best.
- Low execution priority was assigned to the entire Planit system, further exaggerating the effect on each user.

Each of these examples characterizes a Planit system which is (or was) running somewhere. It is most unfortunate that the execution appears to be correct so that the poor performance is attributed to Planit rather than to the manner in which it was installed. In too many instances, the installation effort has been assigned to a university student as a class project, and the result is then taken to be a true measure of Planit's performance. It would have been much preferred that Planit fail to run at all when poorly installed, but that runs counter to the need for flexibility. Thus, it becomes possible for the system to run correctly, although terribly inefficiently.

The reputation for the performance of portable software becomes identified with the particular computer on which its execution is observed. If the response time is miserable, or the terminal's horn "honks," or a long pause occurs for no apparent reason, or the system comes to an abrupt halt, or some I/O request is ignored, that is judged to be the fault of the software. It makes little difference that someone else at a different site is completely satisfied with the same software. The installation work, not being directly observable, rarely enters into one's evaluation of the software's performance.

Some specific Planit examples show the importance of these considerations:

- A federal agency obtained a poorly installed copy of Planit through a user's group, judged it unacceptable and forwarded its evaluation to the Army unit that was funding some Planit work. It turned out that every one of the agency's criticisms was directly attributable to installation errors.
- Planit was considered for use by a writer in a national magazine and the verdict he put into the article was to "scratch Planit." The installation on which he based his verdict was an old prerelease version that had been installed and was not authorized to be run.
- Three computer hardware manufacturers have installed Planit on their machines for the benefit of customers where it was a consideration in the sale of hardware. One of the manufacturers needed it prior to the release date and, being unable to get it through proper channels, pirated a prerelease version from a test site. That version made its way to a number of customer sites and did irreparable damage to Planit's image. Moreover, that installation, which was never updated, is still available today.

The other two companies each carried the installation effort only far enough to conduct a demonstration, knowing that the task was not finished and that another week's work would have completed it. But the demonstration satisfied their immediate need.

(Continued on In Depth/28)

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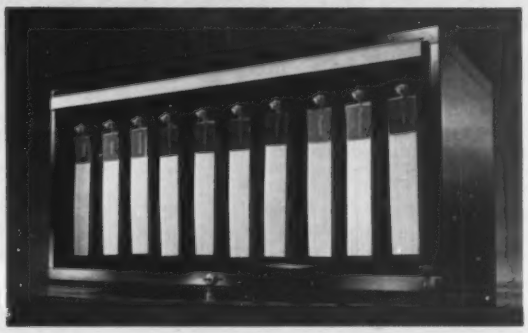

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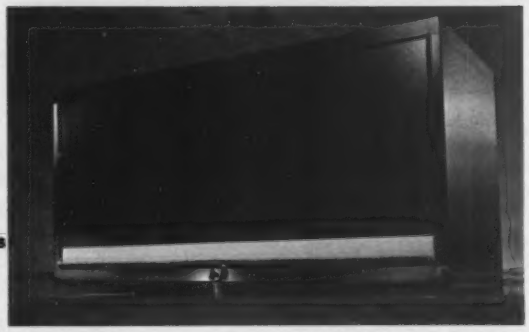

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IN DEPTH

(Continued from In Depth/27)

Those unfinished installations are routinely made available by both companies to their customers.

For every one of the above misfortunes, one could be shown several sites where Planit has been installed correctly and is running well on a variety of equipment. However, the impression of seeing it run poorly cannot easily be offset by the assurance that it is running well somewhere else.

Admittedly, part of the problem in the examples is that Planit is publicly-owned software, having been developed under federal funding. Those who obtain the code can largely do as they please with it. It would perhaps be better if the software were licensed with the contract enforcing proper installation.

4. Traditions. It seems unlikely that anything so young as the computer industry should already be bound by tradition, but it is. Strong opinions have been voiced on the "correct" way to write programs, even to the point of dictating whether GOTO statements belong in the code.

Radical departures from accepted standards of coding invite a surprising amount of skepticism. At issue is not whether it works but how it is done.

One classic example of this skepticism is still in my files. There are many good reasons to criticize my writing attempts, but in one case I attempted to describe the process being used to achieve software portability through preprocessing a master file into Fortran source code for compilation on the target machine. One reviewer disapproved the publication of the article on the grounds that it "represented a poor use of Fortran." That was amazing, especially since one of the earliest claims for Fortran was its anticipated potential for software transferability.

Coding methods for portable software will amost certainly be different because programs coded by today's standards are not portable. There are many attempts at setting language standards. However, the setting of standards which would guarantee software portability might be another matter. Would a standard be considered which disallowed any implicit, uncontrolled data from a program, data such as a return address from a subroutine call that gets pushed onto some internal stack?

These kinds of standards are still beyond the realm of typical standards agenda items. Yet, considerations for portable software will need to deal with many issues such as this, and present coding conventions notwithstanding, truly portable software may look quite different from today's traditional exhibits.

In summary, the computer industry has long believed that software could be coded to be portable but the industry has lacked the incentive to make it happen. That incentive is rapidly becoming irresistible, and a few examples of truly portable software are now either a reality or on the horizon. However, the technical solutions that make the software portable will not completely solve the problems. There is still an industry to convince and many people must be educated if there is to be any real hope of reaping the benefits of a potential multibillion-dollar saving in programming costs.

Dr. Charles H. Frye is the director of the Planit project at the Northwest Regional Educational Laboratory, Portland, Ore.

Frye, who is the author of the portable Planit software and other projects, received his Ph.D. from Michigan State University.

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Burroughs Mainframe Extends 900 Series

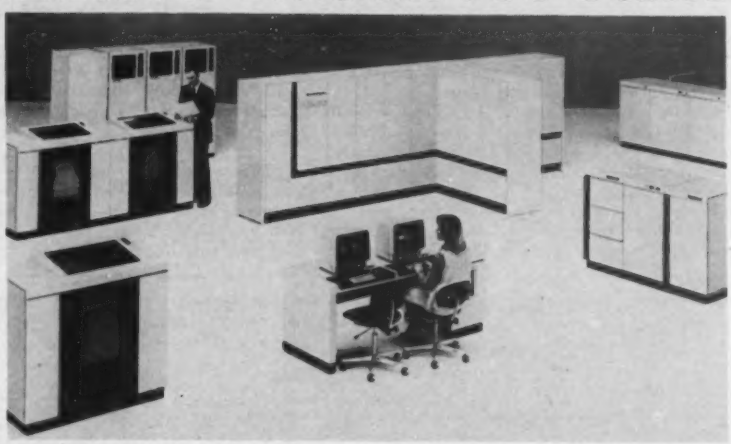
DETROIT — Burroughs Corp. has unleased a fifth 900 series computer into the mainframe jungle, this one featuring a microprocessor-based, integrated I/O and data communications subsystem that can be expanded to include up to 64 data channels.

Designed to compete with the IBM 4341 and 3031 and systems with similar performance, the B6900 is a medium- to large-scale machine, architecturally based on the earlier B2930, B3950, B90 and B1900 computers. However, the B6900 can perform up to 30% more work in a given period than its predecessors, drawing about 25% less power, Burroughs claimed.

However, the vendor declined to release CPU cycle times or related figures, stating that such information is "irrelevant" since the machine's performance is attributable to a combination of hardware and software interactions.

The basic B6900 comes with 3.1M bytes of main memory that can be expanded to about 6.2M bytes in a uniprocessor configuration. With the system's integral Global memory unit — a free-standing memory that can be accessed by a number of processors — memory can be boosted to 15.7M bytes of directly addressable memory in a four-processor setup, a spokesman said.

Unlike its predecessors, the B6900 incorporates the integrated I/O and data communications subsystem. Each of the I/O channels is controlled by its own Data Link Processor (DLP), a buffered controller that Burroughs said relieves the CPU of the bulk of the communications work.



The B6900's integrated I/O and data communications subsystem can transfer data to and from peripherals up to three times faster than earlier models, Burroughs said.

Previous 900 series systems could accommodate only up to 32 I/O channels without the DLP feature.

The DLPs execute I/O commands independently of the CPU and are programmable according to the kind and number of peripherals attached to a system, the spokesman added.

Like its brother systems, the B6900 has a number of Network Support Processors (NSP) that work in conjunction with the DLPs. In a multiprocessor configuration, four B6900s can utilize up to 16 NSPs, pro-

(Continued on Page 62)

Tips Given on Speech Recognition Needs

By Brad Schultz
CW Staff

WASHINGTON, D.C. — Tips on what to look for in buying computer speech recognition systems were presented here recently by Dialog Systems, Inc., an Exxon Enterprises subsidiary that sells such equipment.

At the Communication Networks '80 conference, Dialog distributed literature that listed four issues DP users should explore before looking into speech recognition as a means of data entry. They are:

- Whether speech really is the most appropriate input for their particular applications.
- What benefits the speech recognition system must provide to justify its implementation.
- Whether speech recognition can be easily and effectively coordinated with the user's other facilities.
- How other organizations have applied speech recognition to address the same applications.

Representing a merger of computer and telephone technologies, speech recognition systems are gaining popularity because they offer a more cost-effective, convenient, faster and accurate alternative to communicating data, Dialog maintained.

Typical Application

How are they used? Dialog named sales order entry as a typical data entry application of speech recognition — "either while the sale is being made or immediately afterward." In a retail environment, the speech recognition system might furnish current order status information in response to a salesman's telephone call or a customer's direct question.

Toward such ends, speech recognition systems can prune the user's order processing times and costs and enhance its ability to serve customers, Dialog explained. The technology is faster than mail and more convenient to operate than conventional terminals, the Exxon firm asserted.

Aside from data entry, speech recognition systems can retrieve information — an application that may allow the user to handle hundreds of daily telephone calls with fewer personnel. Speech recognition systems can also enhance a user's security by remembering the "voiceprints" of employees with access privileges and denying access to sensitive files by anyone whose voiceprint is

(Continued on Page 62)

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User Goes From 370 to 470, Triples Processing

ALLENTOWN, Pa. — Air Products and Chemicals, Inc., here has recently converted from an IBM 370/165 to an Amdahl Corp. 470V/7 — with a variety of positive results.

"Our new CPU is not only three to three and a half times faster than our previous one," Thomas N. Hickey, manager of computer operations, said, "but it also provides a virtual operating system capability and gives us substantial growth potential through the addition of memory and channels."

Air Products and Chemicals, an international supplier of industrial gases and chemicals, uses the system for a large number of batch and some online applications, including business applications, order entry, program development and engineering research.

The firm's teleprocessing network, composed of some 100 terminals, links the home office here with various district offices and chemical and gas plants throughout the U.S.

This network also includes satellite transmission from Air Products Ltd., near London, England.

When the company decided last year that it needed a virtual operating system capability to keep up with processing requirements, it had, according to Hickey, two basic choices.

"We could have acquired a new computer with a virtual capability," Hickey explained "or we could have upgraded the 370/165 by adding the Dynamic Address Translation facility. Since the latter alternative was not economical, would have required a long lead time and would not have provided the needed capacity, we decided to install a new machine."

The next question was which machine to bring in. Since Air Products and Chemicals had been a mixed vendor shop for some time, the company began looking not only at various IBM mainframes such as the 3032 and 3033, but also at IBM-compatible machines such as the Amdahl 470V/6 and V/7.

"We needed a machine that would not only provide a virtual operating system capability and take care of our normal growth, but would also have enough power to make the conversion itself," Hickey noted. "This was especially important to us since we are a single CPU shop and thus have no extra machine to fall back on for temporary problems or tasks."

A benchmark was prepared by the Technical Support Group using a variety of both I/O-bound and CPU-bound jobs equivalent to the peak daytime work load. I/O was set equal to the firm's in-house equipment, and the group tracked the percentage of CPU and other resources being used.

"Benchmark tests on the various alternatives eliminated all but the IBM 3033 and the Amdahl 470V7 as viable acquisitions, based on the requirements for excess capacity to accomplish our operating system conversion and to provide for future growth," Hickey said.

"The choice was then between the 3033, with its scheduled shipping date from IBM in mid-1980, and the 470V/7, which was available sooner. We looked into a third-party market for a 3033, but arrangements for the 470V/7 turned out to be more economical."

Smooth Installation

Air Products and Chemicals purchased the 470V/7 and installed it in mid-March of 1979. Prior to installation, however, the company had run the Amdahl-supported operating system on the 370/-165, so all potential bugs were worked out before the hardware switch.

The machine went up smoothly. It was delivered on March 15, assembled on the March 16 and 17, ran its first jobs on March 18 and was turned over to the company for production work on March 19.

Air Products and Chemicals' 470V/7, with 8M bytes of memory and 12 channels, is currently running OS/MVT under VM/370. The company plans to switch over to MVS very soon. Program development and text editing are handled by Super Wylbur, a software package developed at Stanford University.

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On-Line Order Entry Speeds Customer Service

LOUISVILLE, Ky. — "Our computer system has allowed us to grow without increasing our overhead appreciably while at the same time permitting us to improve customer service still further," according to Robert G. Pfeiffer, vice-president and treasurer of Neill-LaVielle Supply Co. here.

Pfeiffer, who is responsible for DP operations, was referring to the company's Univac 90/30 system, on which on-line order-entry operations were inaugurated this year.

A 99-year-old business, Neill-LaVielle stocks some 50,000 different items and has an average inventory value of $4 million. The business services Kentucky, northern Tennessee and southern Indiana. Currently, Neill-LaVielle's annual growth rate is averaging 18%.

In the last 10 years, sales have more than doubled, increasing from $8.13 million in 1968 to $19.25 million in 1978.

The 90/30 System has a main memory of 262K bytes, four dual-density Univac 8418 disk drives providing 224M bytes of mass storage, a card reader, punch and integral printer.

Seven Univac UTS 400 terminals are linked to the 90/30 system. Four of them — together with a Univac 0786 printer — are dedicated to order-entry functions at the Louisville facility. Two of the seven are used in an adjacent subsidiary company, Bearings, Inc., and the final terminal is sited in a branch warehouse in Lexington, Ky.

Pfeiffer noted that the procedure used before the on-line system started had been to pick orders twice daily in the warehouse.

"Now we pick the orders as soon as they are edited and priced and make every effort to get them shipped the same day.

"We have far better control of our orders, and the information is more up-to-date. We can handle customer inquiries about their back orders within a few seconds.

"It was possible to do this before, but it meant a lot more work and paper chasing. When you consider we handle a daily average of 650 orders and 34,000 line items monthly, the on-line system has meant a considerable time-saving in handling orders."

Now, as soon as the request has been processed, it is printed out on the 0786 printer located adjacent to the order entry terminals. After each printing the orders are separated and taken into the warehouse — located in the same building — for immediate picking.

The Lexington branch warehouse uses its UTS 400 terminal to inquire about Louisville's stock if the item is not available in Lexington. If Louisville has the item, the order will be entered in Lexington, printed out in Louisville and shipped to the customer.

"Most of our billing is done the day following shipment. We bring the orders up on the screen, enter the shipping information and have the computer produce the invoices," Pfeiffer said.

"We track the performance of the inventory management system we developed by accumulating service levels for each item we stock. Our current three-month average shows that we are filling 84% of our orders the first time," he added.

"Our company policy is to economically justify every computer expenditure. We've been able to do that throughout our history with Univac equipment, starting in 1971 when we acquired a Univac 9200 system to replace IBM unit-record equipment.

"The 90/30 arrived early in 1977 with an initial main memory capacity of 65K bytes. Since then, we've increased the main memory twice to its present 262K bytes.

"In our operating experience with the 90/30 we feel it has a good price performance ratio, and we particularly like the Information Management System 90," he said.

The on-line order entry system at Neill-LaVielle Supply Co. handles a daily average of 500 orders.

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Uptime Increased to 95%

MIS Department Blends Corporate, DP Strategy

By Marguerite Zientara
CW Staff

RACINE, Wis. — Reduced inventory, more computing power, a more reliable data base and an on-line uptime increase from 60% to 95% resulted when a conglomerate branch here established a management information service (MIS) department a year ago.

While the Jacobson Division of Providence, R.I.-based Textron, Inc. has been using computers in its diverse manufacturing operations for 14 years, until last year it did only routine processing of financial and inventory data, with occasional special requests from department heads.

Since 1966, the division has moved from an IBM 1401 to a 360/40 and then to a 370/135 with 512K bytes of memory. But a little over a year ago, a management decision turned these desultory transitions into a meaningful attempt to integrate the DP function into the actual growth of the company.

In an effort to make each department more productive and efficient by providing timely information to aid daily business decisions, the Jacobson Division hired D. Michael Meyer — a 10-year DP veteran — to develop and head a new MIS department.

Meyer came on board Jan. 3, 1979 and on Feb. 19 an IBM 370/148 with 1M byte of memory was delivered to the division, Meyer recalled. "The time frame we had to work with was very, very short. We were completely out of gas on the old machine. . . so we did not go through a lengthy vendor analysis or plug-compatibles or anything else.

"We just needed a new machine to give us some breathing space," he said. Things had gotten so bad, in fact, that the firm was able to run daily processing jobs only three times a week, he noted.

Fortunately, the transition was "extremely smooth," according to Meyer. "The CPU hasn't been down more than three, four or five hours since we put it in."

With "very, very few" hardware problems — attributed to an upgrade that implemented "one change at a time" — the system and the MIS department have provided a "tremendous morale boost" throughout the company, to both manufacturing and management personnel, Meyer said. "There was no resistance to the system."

Closing Gap

Perhaps the most vital element to the plan's success has been closing the gap between the managers of various departments and the MIS department, Meyer indicated.

To do that, each department named an MIS coordinator, who received training in data processing. At the same time, MIS personnel have been schooled in Jacobson's overall operations.

Management and MIS coordinators really call the shots on how departments can best use DP, Meyer said. In turn, the MIS department functions as an "in-house" service organization geared to helping coordinators develop special programs to generate the information they need.

MIS personnel have more than doubled, and the overall role of Jacobson MIS executives has been expanded considerably. They now participate at the planning stage of corporate policy, helping determine costs and risks as well as systems implications.

Heart of Department

The heart of the whole department, of course, is the IBM 370/148, which doubles the processing capacity of the previous model, Meyer said. Besides the CPU, the system includes a Model 3203 printer operating at 1,200 line/min and 57 Model 3278 CRTs, 11 of which have 120-char./sec 3287 remote printers connected to them.

The smallest details on this riding mower — including anticipated sales — are included in the MIS department's computerized report, which aids in daily decision making.

While the previous system incorporated Model 3410 and 3411 40K-bit/sec tape drives, the new configuration includes 3420 Model 6 tape drives, operating at 780K bit/sec with 800 bit/in. Disk storage has been doubled to nearly two billion characters.

No Printers Needed

Next door to Jacobson's headquarters here is the main manufacturing plant, which needs no high-speed printers, Meyer said. "We can walk right out our back door and hand-deliver things."

Half of the 57 CRTs are in the Racine manufacturing plant, while the other half are connected by dedicated 9,600 bit/sec telephone lines to another plant in Brookhaven, Miss. In addition, five are used for on-line program development at headquarters in Racine. Four of the 11 remote printers are in Brookhaven.

Brookhaven also has a Data 100 Corp. 1,000 line/min remote job entry (RJE) terminal, which replaced a 300 line/min IBM 2780 RJE terminal last November. The Data 100 terminal is a card reader, has key-to-disk capability to replace keypunching and can be used concurrently as a high-speed printer.

Upgrade Planned

The system runs under IBM's DOS/VS Release 34 with Advanced Function; it will be upgraded to DOS/VSF in March. Its on-line software system is IBM's CICS Release 1.4. IBM's Dbomp file management system will be converted to DL/I in June.

There are also a number of independent packages: Job Accounting Report System from Johnson Systems, Inc. of McLean, Va.; Answer II Report Writer from Informatics, Inc.; CA-Sort, CA-Dynam-D (disk management system) and CA-Dynam-T (tape management system) from Computer Associates, Inc.

Also being used are Panvalet, the source file management system from Pansophic Systems, Inc. and the Westy Disk Utility System from Westinghouse Electric, Corp.

Belgian Cleaning Diskette Available in U.S. Market

CLEVELAND — The CCL 140 Diskette Head Cleaner is now available for the first time in the U.S. computer market, according to Computer Resources, Inc.

The cleaning diskette, which cleans the read/write head in 30 seconds, is inserted into the drive the same way as a floppy disk.

Cleaning performance is obtained through a special lamination.

Diskette Head Cleaners are sold in packages of three for $75 and are manufactured for all compatibilities: 8-in. CCL 140s, for single-side drives; 8-in. CCL 140-ls, for double-side drives; 5.25-in. CCL 1400s, for single-side drives; and 5.25-in. CCL 1400-ls, for double-side drives.

The CCL 140 Diskette Head Cleaner is produced under the label of Compuclean by Chemimetal S.A., Belgium, and is sold in the U.S. exclusively by Computer Resources, Inc., 4650 W. 160th, Cleveland, Ohio 44135.

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FUTURE SYSTEMS FORUM II presents another in-depth program to analyze and forecast new products, new software and services and new technologies for the 80's. You will hear top speakers representing some of the leading large scale manufacturers and users from diverse industries. Companies like Exxon, GE, IBM, Motorola, Nippon Electric, Texas Instruments, Satellite Business Systems and Electronic Data Systems, among others.

You'll get a wide range of vital information and projections on the 80's. The kind of accurate forecasting heard at last year's Forum, such as 303x pricing, IBM's Newport series and memory price trends.

FORUM II's agenda includes crucial topics and issues, particularly the anticipated IBM H series, software trends, telecommunications and office automation, their impact on the information systems industry, competitors and users.

MONDAY, MARCH 3

Charles P. Lecht, *President Advanced Computer Techniques and author of "The Waves of Change."*
Keynote Speaker. "The Next Twenty Years of Computer and Communications Technology".

Since "The Waves of Change" was first published in 1978, the rate of change in this industry has, in fact, accelerated. Mr. Lecht will explore the immense and varied possibilities for the Information Systems industry which technology may make possible by the turn of the century. E. G. VLSI, Josephson's Junction, bubbles, intelligent panel displays, fiber-optics, etc.

Conventional assessments of the data processing industry, preferred by industry spokesmen whose biases are well established, tell us that it is in an *evolutionary phase* – an orderly transition of some kind. Mr. Lecht maintains, "nothing could be further from the truth. A *revolution* in the way we produce, acquire and use electronic computer and communications technology is brewing, and it will result in change the magnitude of which will swamp what has thus far occurred. We are beginning 'A Great Transition' to a new era where computer and communications technology will represent a driving force for a new and beneficial industrial revolution."

Technology for the 80's:

Ian Le Mair, *Manager of Strategic Marketing (Microprocessors) Motorola, Inc.*
"The MC68000 – The Effect of High Performance Microprocessors on Computer Systems in the 80's." The combination of the microporcessor in computer architecture plus the challenge of making VLSI technology real have given birth to a new generation of microprocessors that will challenge traditional mainframes of the 1980's. The features of MC68000 and the implications of VLSI on computer systems will be discussed.

Dr. Egil Juliussen, *Senior Member Technical Staff, Texas Instruments Corporation and* **Dr. Portia Isaacson,** *Vice President EDS Business & Educational Series Corporation*
"Future Computing." Trends in hardware technology: memories, mass storage, processors, communications; applications: small business systems, information distribution; software: pricing, future languages, distribution; service/maintenance: remote diagnostics, manufacturers service, built-in testing; impacts of future technology on corporate DP.

Paul Quantz, *Manager, Computer Aided Engineering and Manufacturing Council, General Electric Company*
"The Computer Invasion of Engineering & Manufacturing." The implications of computer aided design and manufacturing on future system architecture, data management and control, software applications, software design, user interface design.

Dr. George Champine, *Vice President, Research & Product Development, Vydec, Exxon Corporation*
"The Database Processor of the Future." Database processors are specialized information processing systems tailored for information storage and retrieval. This technology is moving out of the research phase and should be in the marketplace within three years. The various approaches being pursued in database processors and the advantages and disadvantages of each will be reviewed.

Panel Discussion led by **Thor Thomsen,** *Vice President, ACT Corporation.*

Software Productivity Tools & Applications Requirements in the 80's:

Art Benjamin, *President, Art Benjamin Associates Ltd.*
What are the most significant obstacles to higher productivity in application design and development? An examination of systems architecture based on realistic concept of the "system cycle." How such an architecture can solve the major problems of development productivity and application usability.

A Japanese View of the U.S. Computer Market:

Dr. Hiromu Kaneda, *Senior Vice President, Nippon Electric Company*
Differences between Japanese and American markets; NEC's view of IBM and other U.S. competitors; the future of NEC in U.S. computer market; NEC's assessment of its own strengths as a competitor; experiences to date.

Communications Networks and Services for the 80's:

James W. Patty, *Assistant Director, Marketing Support Programs, Satellite Business Systems*
"An overview of SBS and its planned services." The current status of SBS; planned milestones; an overview of the SBS system and its features; applications and benefits of the SBS service.

AT&T (speaker to be announced)

Forum Discussion
Cocktails

TUESDAY, MARCH 4

IBM H-Series Forecast, 1980-84:

Robert T. Fertig, *President, Technology Analysis Group, ACT Corporation*
What are some of the market forces at play in the "Information Systems" marketplace? Has Grosch's law been killed or will it awake again in the 1980's? What new performance/price "standards" can we expect from the H-Series and when? How can IBM protect, grow and maintain control over its customer base during the transition to systems in the 80's? What changes in large scale system architecture, design and technology can be expected from IBM and how will this impact EDP management?

Competitor Views on Large-Scale Systems for the 80's:

Fred W. Bauer, *Director, NCR Corporation, "Design for Growth"*

John Selman, *Manager, Market Analysis Services, Honeywell Information Systems*
"Large scale systems for the 80's: The users' outlook as Honeywell views it."

Neil Gorchow, *Vice President, Sperry Univac*
"Large scale systems trends for the 80's."

How will the other major computer manufacturers maintain and improve their competitive posture in the 1980's? What changes in systems architecture, design and technology can be expected during this period and how will this impact DP management? Will the operating systems, and other software developments keep pace with the likely improvements in hardware? Will distributed processing and network nodes subtract from or add to the demand for more powerful host processors? How will the mainframe companies address the key issues of programmer and applications' productivity, and rising maintenance costs and shortage of skilled programmers/analysts.

Prospects for the Evolution of Large-Scale Systems in the 80's:

IBM *(speaker to be announced)*
What are some of the realistic expectations on the future of large scale systems and their effect on the data processing industry in the next decade. What are the trade-offs between small scale systems and distributed processing versus large scale products? How can management plan for an orderly transition to take advantage of the new technologies (hardware and software in the 80's)?

Industry Outlook: The Wall Street View:

Dr. Ulric Weil, *Vice President, EDP Research, Morgan Stanley, Inc.*
"The Demand Bubble." Anticipated major new product announcements; end user expenditure patterns, data processing demand; the E and H series; impact on competitors and their options; pricing as a competitive tool; IBM's current business strategy.

Office Automation: Current Experiences and Future Direction:

Dr. George Champine, *Vice President, Vydec, Exxon Corporation*
"The Integration of Word and Data Processing Within the Corporate MIS Function." Word processing and text processing systems have mechanized many of the document generation functions previously performed manually with the typewriter. The next logical step is to integrate the word and text processing subsystems into the overall corporate information system. The future roles that word and text processing subsystems can play in integrated information systems along with the functional division of activity between the work station and the main frame.

George Potter, *Director, Sales Promotion – Office Automation, WANG*
The direction of the office automation market; the integration of word and data processing; the role of office automation and electronic mail; how office automation can improve office productivity.

Panel Discussion led by **John Phillips,** *Executive Vice President, ACT Corporation*
Cocktails

WEDNESDAY, MARCH 5

The Great Transition – A Special video film Report:

Herman Kahn, *Director & Chairman, The Hudson Institute and author of The World Economic Development.*
The reports describe a phenomenon known as "The Great Transition" – a 400 year period beginning with the industrial revolution, which, providing technology and the economy are properly managed, should see mankind moved into a more affluent and prosperous world in the next two decades.

Strategic Planning for Distributed Processing in the 80's:

Hal B. Becker, *Manager, Distributed Systems and Networking, ACT Corporation*
Are current information system strategies consistent with observed management philosophies? How fast is dependence on automated information management growing? What direction and rate of change is perceived in the user community? Do the emerging distributed technologies offer workable, cost justified solutions to all users?

User Views on Challenges & Opportunities for Information Systems of the 80's:

Presentations and panel discussion including the following companies: **ITT, Hughes, General Host, Exxon and others.**

Key issues and discussion areas:
- IBM 4300 experiences to date
- User views on competitive posture of IBM 4300
- User challenges in the use of new technologies
- Need to determine the proper level of distributed processing while maintaining data integrity & control
- Technology forecasting
- Other challenges & opportunities in the 80's.

NOTE: Program and speakers subject to change.

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Tips Offered on Speech Recognition Systems

(Continued from Page 57)
not in a special computer-stored library, Dialog indicated.

More specifically, current applications for speech recognition systems include processing of financial transactions; transportation industry applications such as passenger reservations and weather reports for airline flight crews; and manufacturing tasks such as machine control and parts sorting.

Speech recognition also helps insurance companies locate policyholders' files and colleges schedule classes, Dialog continued. In government, the military constitutes what may be the largest speech recognition users group.

Finally, speech recognition serves handicapped persons who lack a physical ability to operate conventional terminals or — outside DP environments — allows the handicapped to operate domestic appliances remotely.

Four Categories

There are four ways to categorize speech recognition systems, Dialog said. First, the system is either speaker-dependent, recognizing only those voices it has been trained to recognize, or speaker-independent, able to recognize anyone's voice.

Speaker-dependent systems generally come with larger vocabularies of understandable words, but are impractical for more than about 10 operators because they are especially sensitive to minor voice changes and noise interference.

Conversely, speaker-independent systems tend to have smaller vocabularies but can handle input from a larger number of people. These systems employ "master patterns" for each vocabulary word and, to an extent, are tolerant of regional accents and differences between male and female voices, a Dialog spokesman noted.

A second point of distinction with speech recognition systems is made by the amount of speech recognizable in a given time frame. Most current speech recognition systems recognize words spoken one at a time with a distinct pause between each word, the spokesman said. They are the most appropriate systems for accommodating large numbers of people.

On the other hand, a so-called "connected speech" system allows the speaker to talk fairly rapidly and naturally without pausing. These systems reportedly understand phrases — strings of words or digits — just as they would a discrete word, the Dialog source explained.

A third way to categorize systems is by whether they are single-channel — able to handle only one speaker at a time — or multichannel — able to handle a number of people simultaneously.

Finally, speech recognition systems that employ microphones as the means of input can be distinguished from systems that employ telephones as the input medium. Most current speech recognition systems require microphones, the spokesman observed.

While headset microphones give the operator freedom of movement, telephones may be more appropriate for long-distance transmissions.

Searching for System

In searching for the right speech recognition system, the user should make the "first cut" on the basis of how many people will operate the equipment and next on the basis of whether input will be via microphones or telephones, Dialog advised.

After that, recognition accuracy should determine system selection, the vendor continued. Fourth in importance is the time needed to train operators. Dialog said speaker-dependent systems vary widely in this respect.

Throughput is a fifth priority factor in looking for a speech recognition system, the Exxon firm suggested. This involves an assessment of how fast the system should be in processing the input.

Operator attitudes — the "human factors" — are another matter for the user to consider. Some personnel may resist certain types of systems.

Cost is the seventh factor in system selection. Speech recognition systems that incorporate processors but lack voice output gear generally sell in the $20,000 to $25,000 range, the spokesman estimated.

Complete systems, which include voice output devices and applications software, may cost between $25,000 and $100,000, he continued. However, simple word recognizers that lack an integral computer go for less than $5,000.

'You Can Change the Tapes — I'm Afraid of Heights.'

B6900 Subsystem Combines I/O and Communications

(Continued from Page 57)
viding a capacity of 1,024 communications lines.

Although Burroughs insists the new system isn't particularly slanted for the communications-oriented user, the spokesman said it can be expanded modularly to meet network demands.

While all of the 900 series machines are source and object code compatible, previous systems cannot be fitted with the I/O and data communications subsystem and therefore cannot be upgraded to the B6900's communications capabilities.

Enhanced MCP

All of the B6900's hardware and software facilities are managed by the firm's Master Control Program (MCP), which allocates resources in relation to the system's active jobstream. The MCP is included in all 900 series mainframes, but has been enhanced with the B6900 to support the data communications subsystem, the spokesman said.

The CPU-managing MCP is included as part of a system software facility package that also consists of the firm's Network Definition Language compiler, which implements or reconfigures a data communications network; a Generalized Message Control System; and a high-level programming language compiler. The software package costs $36,300 plus an annual license fee of $5,808. It can also be obtained for a single monthly license fee of $1,210.

In addition, the B6900 has a microprocessor-based maintenance processor that reportedly enables diagnostic software to run concurrently with the user's application programs.

Finally, the processor can be programmed in Cobol, Algol, Fortran, PL/I or Basic.

The basic B6900 system, labeled the B6930, includes a CPU with 3.1M bytes of main memory, the maintenance processor, the NSP, an operator console and an I/O subsystem with five DLPs. It can be purchased for $440,000 or leased for $11,440/mo on a five-year lease.

Initial deliveries are scheduled for the second quarter, the spokesman said from Burroughs at 1 Burroughs Place, Detroit, Mich. 48232.

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Speedup, Protection Systems

Nassau Unwraps DEC Mini Accessories

CINCINNATI — Nassau Systems has unwrapped a CPU speedup system and an overtemperature protection system for Digital Equipment Corp. minicomputers.

The CPU speedup system is said to make the PDP-11/70 run about 15% faster and result in a 12% to 15% increase in the processor's instruction throughput rate.

Structured not to compromise the user's field service contract, the B-11 unit is available in four different models, ranging from a do-it-yourself parts conversion kit for converting the existing CPU timing module to a completely modified and tested module, according to the vendor.

The modified B-11 timing module plugs into the user's processor. Purchase includes all construction, installation, testing, maintenance and field service policy procedures, a spokesman stated.

Selection of the appropriate speedup unit is based on the user's technical expertise and the capabilities of the user's local field service office.

The overtemperature protection system warns the user when machine temperatures reach a potentially damaging level and subsequently shuts down the system's power if the situation is not corrected.

The C-XX protection device is a desktop "black box"-type unit connected by a 25-ft cable to a sensor which is suspended in the circulating air stream inside the processor. A second cable links the protection unit to the computer's power distribution and control system, giving the device the ability to shut down the CPU's overall power.

Manual Override

In the event of a temperature rise, the unit sounds an audible alarm to notify computer room personnel. If the temperature continues to rise another few degrees, the device will shut down the processor.

However, an operator is given time to terminate system software while manually overriding the automatic power shutdown feature so that no programs are lost midstream, the spokesman explained.

Designed to fit all DEC minicomputers, the C-XX is structured to supplement DEC's standard processor protection system which, according to Nassau, is more of a fire extinguisher support system than a temperature warning device.

The C-XX is reportedly fully compatible with all DEC standard equipment and systems.

The overtemperature warning unit, including operator control box, sensor, latching relay contacts, cables, connectors and documentation, costs $749. The B-11 speedup kits are priced from $489 to $2,989, depending on whether the user wants to convert the existing timing module or insert a completely modified version.

Additional information on either device can be obtained from Nassau at P.O. Box 19329, Cincinnati, Ohio 45219.

Mini-Based System Fits Apparel Maker's Growth

Saint Tropez West uses a minicomputer to make ordering more accurate — bringing fabric projections to within 1% of sales.

Special to CW

LOS ANGELES - What do minicomputers and tape drives have to do with the world of haute couture? Everything, if you're a garment manufacturer who wants to keep track of rising expenses, fabric projections and other aspects of the industry.

Saint Tropez West, a division of California Fashion Industries, Inc., ended its first year of business in 1975 with a total sales of about $900,000, a not-too-spectacular figure in the garment industry.

However, in 1979, the company showed a sales total of approximately $24 million, a growth that would not have been possible without a computer to handle the business end according to Leonard Rabinowitz, the firm's president and founder.

Saint Tropez has a Hewlett-Packard Co. HP 3000 minicomputer system that was originally leased and later bought by the company. The system has a 250K-byte memory and is tied to two Model 7920 disk drives that have a capacity of 50M bytes of storage per drive.

The firm also utilizes a 600 line/min printer and has seven HP 2640 and 2645 terminals located here and in the company's New York showroom, Rabinowitz stated.

The apparel manufacturer was first introduced to HP equipment by Silton Data, a company based here that leases and sells HP machines and is familiar with garment house accounting systems.

Silton Data conducted a feasibility study on Saint Tropez and evaluated the company's needs based on its volume, styles, costs and estimated future requirements. Saint Tropez was brought in initially on a service bureau agreement, which allowed it to maintain an operations program at a low cost.

On-Line Reports

The HP equipment provides on-line reports on sales analysis, fabric analysis, dye lot analysis; group distribution, shipping allocation and financial reporting.

Through these reports, Rabinowitz is able to determine at any time how his salespeople are doing, what his fabric requirements, inventories and projections are, which work is in progress and which completed, which garments need to be shipped out, what his credit hold status is and each account's gross profit.

Seasonal Operation

"The garment industry is a seasonal business," Rabinowitz said. "You have to sell everything in stock, and accomplishing that requires close management operation. A manufacturer has to have a handle on which styles and colors he has at all times."

(Continued on Page 64)

MPU From Wave Mate Includes UCSD Pascal

CARSON, Calif. — Wave Mate, Inc., manufacturer of the Jupiter family of microcomputers, has introduced a system that incorporates two double-density floppy disk drives and utilizes its UCSD Pascal software package.

The Series 2000 microcomputer is a stand-alone system with two microprocessors that deliver a total of 64K bytes of random-access memory, two floppy disk drives that supply 368K bytes of formatted storage, a disk controller, a bootstrap read-only memory, a 12-in. CRT screen, a keyboard with function keys and a numeric pad and two serial ports.

The system was designed to accommodate the future attachment of Winchester-type disk drives, a spokesman claimed. The entire system weighs about 50 lb.

The Pascal software package, adapted by the firm to operate on the Series 2000, consists of a disk operating system with file handler, a one-pass Pascal compiler that produces a universal P-code, a full screen and character editor, a conditional macro assembler, a linker, a P-code interpreter and a utility library.

The Series 2000 with the Pascal package costs $3,450. However, a 32K-byte version without the UCSD software sells $2,995, the spokesman said from 18005 Adria Maru Lane, Carson, Calif. 90746.

MSC Controller Interfaces IEEE 488 Bus to Hard Disks

SUNNYVALE, Calif. — Microcomputer Systems Corp. (MSC) has announced an intelligent, single-board controller that can interface the IEEE 488 communications bus to two Shugart Associates SA4000 series Winchester drives that store up to 58M bytes of data each.

The MSC-1088 controller provides error correction and self-testing features, as well as upgrades from 14.5M bytes to more than 100M bytes. The device is completely compatible with the IEEE-488 bus.

Features include write protection, automatic head and cylinder switching, relative addressing, automatic seek to alternate tracks and a variety of diagnostics. In addition, the controller can reportedly verify disk positioning and buffer data.

The unit's high-level command set can be used to write disk-operating task. As an option, MSC alternately will supply software integration versions with custom firmware for the device's on-board bi-polar microprocessor.

The controller costs $2,650 from MSC at 432 Lakeside Drive., Sunnyvale, Calif. 94086.

MPU-Based Law System Gives WP, Calendar Control

BEVERLY HILLS, Calif. — Alpha Professional Systems has introduced a microcomputer-based office system, designed for law firms, that incorporates word processing (WP), billing, accounting and calendar control capabilities.

Built around an 8080-based microcomputer, the Alpha System 7 has 64K bytes of random-access memory and up to three 8-in. floppy disk drives, each storing more than 125 pages of text, a spokesman said.

The system also has a 15-in. CRT terminal, an IBM Selectric-II-type keyboard and a 600 word/min printer.

Oriented toward long document and brief preparation, the computer can search and replace words or phrases in a document, add or remove blocks of text, number pages or merge various files. In addition, the system can manage a daily and weekly events calendar with entries stored according to attorney, client or file number.

Finally, the System 7's optional client billing program accommodates up to 20 lawyers and provides accounts receivable, retainer and trust account ledgers for each client and case, the spokesman noted.

The price of the system begins at about $14,000 with leasing available from the company at Suite 518, 9465 Wilshire Blvd., Beverly Hills, Calif. 90212.

The Alpha System 7

System Tailored for Clothing Maker

(Continued from Page 63)

Looking back on the manual record-keeping system Saint Tropez maintained earlier, Rabinowitz noted that it was ineffective in handling customer inquiries as the company grew. Ninety percent of the orders shipped out under the old system were correct, but it was the 10% of incorrect shipments that cemented his decision to computerize, he said.

"Since going on-line, our growth has been staggering. If I had to attribute this to any one factor, I'd say that now we're able to get our orders in and figure out exactly what raw materials we'll need."

Crucial Areas

Deciding on what materials are needed and inventory are probably the two most crucial areas in the garment manufacturing industry, the firm's president explained.

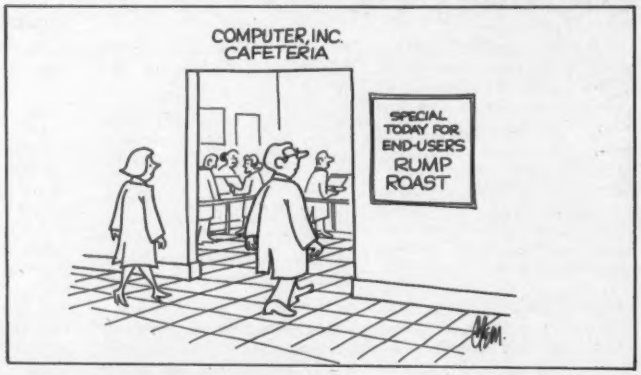
All garments in the Saint Tropez line are made from wools, linens and silks, expensive fabrics for which there are no secondary markets. Once the fabric is cut and the garment made, it must be sold or it hangs in the warehouse indefinitely, Rabinowitz pointed out.

"After you've ordered your materials and made your garments, you're committed. Your business can die if you make a big mistake."

Finally, Saint Tropez' founder observed that the beginning of any fashion season is a critical time, and if a manufacturer has to wait for his materials, it can mean a big loss in sales. However, the HP 3000 allows the firm to know within two or three days which materials it will need to begin production.

The Saint Tropez line includes approximately 300 different styles. Any one garment might require as many as three different fabrics, so it is necessary to know exactly how much fabric is needed for each piece.

Maintaining this information is hard, at best, using a manual system. With computerization, Rabinowitz can take any one fabric and find out immediately how many yards have been sold, how many yards cut, the total purchased, the total received and exactly what is available to sell.



TRS-80 Gets Voice Response

FORT WORTH, Texas — Radio Shack has introduced a device for its Level II TRS-80 microcomputer that allows users to experiment with voice recognition.

The Voxbox can be programmed with a vocabulary of up to 32 words and is said to let the user enter data, control and instruct the TRS-80 system without having to type on the keyboard. The user decides what words are to be used and what specific actions are to be performed, a spokeman stated.

The unit reportedly can recognize about 85% to 95% of the words programmed into the computer's memory. A machine-language driver program and three demonstration programs, an owner's manual and microphone are supplied with the paackage.

Voxbox costs $169.96. Additional information can be obtained from the firm at 1300 One Tandy Center, Fort Worth, Texas 76102.

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Donated Mini to Generate Student RAP Sheets

Special to CW

CHATTANOOGA, Tenn. — Hewlett-Packard Co. last month donated to the University of Tennessee at Chattanooga (UTC) a $99,000 minicomputer system that will be used by the faculty to provide computer-generated academic roadmaps for student travelers.

The system, an HP 3000 Series II Model 6, was presented to UTC Chancellor James E. Drinnon Jr. It includes 256K bytes of main memory, an HP 2460B systems console, a 7970E magnetic tape subsystem, a 7926 magnetic disk subsystem and a terminal controller capable of supporting up to 16 asynchronous communications terminals.

Software includes the disk-based MPE III operating system, designed to handle multiple users.

The mini will supply a "Report of Academic Progress" (RAP) for each of UTC's 7,500 students, according to Drinnon. Basically, the report is a computerized outline of each student's requirements for a specific degree and major program.

The Rap will compare a student's academic progress with his degree goal and, hopefully, advise the student or teacher if a student is wandering off a particular academic path.

The RAP specifies the student's general education, major and minor requirements, courses completed and courses needed to fulfill requirements.

Additional information included in the RAP consists of advanced placement information, college admissions test data, transfer course information and any apparent course deficiencies.

"With this new equipment, we will be able to give our students the sort of academic advising which can help them earn their degrees quickly and efficiently," Drinnon said.

"Rap will have this data ready for the adviser and his students, and the advisers will have more time to counsel their advisees and help them with their problems," he commented.

Entry-Level Mini Mounts Within CRT Terminal

FULLERTON, Calif. — Bytronix Corp. has introduced an entry-level minicomputer system that includes a processor and disk, printer and CRT controllers all packaged on a single board, mounted within a CRT terminal.

The Series 500 has a 16-bit CPU with a real-time clock and 64K bytes of MOS memory. The disk controller can handle up to two 10M-byte floppy disk drives and the printer controller will drive one device.

A teletypewriter I/O port on the computer allows the user to add a second CRT, a spokesman said.

The system is software-compatible with the firm's OEM Series 1000,2000 and 3000 machines and can be operated under a number of commercially available operating systems using mainly high-level Basic or Cobol.

All of the Bytronix systems use the same Data General Corp. Nova instruction set.

The basic single-CRT system costs $3,950. Quantity discounts are available, Bytronix said from 2701 E. Chapman Ave., Fullerton, Calif. 92631.

DEC, Heath Gain Memory

WESTLAKE VILLAGE, Calif. — Chrislin Industries, Inc. has unveiled a plug-in memory module that can be expanded up to 128K words of memory for Heath Co. H-11 and Digital Equipment Corp. LSI-11, LSI-11/2 and PDP-11/03 microcomputers.

The CI-1103 features an 8K by 16-bit dual-width board using 200 nsec 4K by 1-bit memory devices or a 32K by 16-bit board with 200 nsec 16K devices. The memory addition is available with either on-board distributed refresh or external refresh control logic.

Data access time is 300 nsecs with a cycle time of 525 nsecs, a spokesman claimed.

On-board memory select is available in 2K increments.

The 8K board costs $390, while the 32K version sells for $750 from Chrislin at No. 102, 31352 Via Colinas, Westlake Village, Calif. 91361

Ribbon Cartridges Fit Qume Printers

SAN JOSE, Calif. — Qume Corp. has introduced two ribbon cartridges for its line of printers that incorporate a device which holds the ribbon closer to the printer platen.

The Multistrike II and Multistrike III ribbons are designed to accommodate a restructured bail arm that will be a part of all Qume printers manufactured after March 1, a spokesman said.

The new cartridge and assembly combination will reportedly permit virtual snap-on loading.

Multistrike II and III cost $5.50 and $7.65, respectively, the spokesman said from 2350 Qume Drive, P.O. Box 50039, San Jose, Calif. 95150.

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Two More Business Units

GA Micros Give Greater Performance Than 220

ANAHEIM, Calif. — General Automation, Inc. has expanded its microcomputer business systems line by adding two processors, one of which it said provides up to 100% performance improvements over its previous offering at a lower cost.

The GA-230 consists of an MPU that incorporates a memory service module with 128K bytes of memory and full byte parity. The system has an autoload feature with an interactive console interface and a chassis with a built-in power supply, a spokesman stated.

Selling for about $6,650, the unit is priced 30% less than GA's earlier 220 microcomputer.

The second micro introduction, the GA-240, offers 100% the performance of the 220 in equivalent configurations. The system's MPU features an extended instruction set and 128K bytes of 22-bit error-correcting memory.

The machine has RS-232C and current-loop serial I/O interfaces, as well as other options offered with the 230. The GA-240 costs $8,500.

Both the GA-230 and GA-240 are available in expanded configurations that boost the number of I/O slots in each system by 50% and include a larger rack-mounting power supply. The 240's memory can be stretched to 512K bytes on a single board.

Although the two systems offer price/performance advantages over the GA-220, GA will continue to support and sell the earlier system, it said from headquarters at 1055 S. East St., Anaheim, Calif. 92805.

Magazine Starts for S-100 Users

MOUNTAINSIDE, N.J. — A magazine is now being published here for S-100 microcomputer users that deals with such topics as 16-bit microprocessors, interfacing techniques and software languages.

Edited by Sol Libes, the author of 13 computer-related books and founder and past president of the Amateur Computer Group of New Jersy, *S-100 Microsystems* will be published six times a year and cover a variety of issues dealing with S-100 machines.

The publication will also spotlight word processing, system development, data base management, scientific and other applications.

A sample copy of the magazine costs $2. Charter subscriptions cost $7.50 for one-year, $14 for two years or $21.50 for three years. Canadian and foreign subscriptions are $9 and $20 annually, respectively, plus air mail postage. The charter subscription offer expires April 30.

The publication can be reached at Box 1192, Mountainside, N.J. 07092.

Datalease Offers Series/1 Discount

WESTPORT, Conn. — Datalease Corp. has announced a 5% discount for customers leasing as few as three IBM Series/1 minicomputers. IBM offers the same discount on a 50-unit purchase, according to Howard Kozinn, Datalease president.

All of the Series/1 machines offered by Datalease are new, installed and serviced by IBM. However, when they are leased from the Westport firm, the customer reportedly gets a 15% discount on IBM maintenance.

Faster Delivery

Delivery and installation times are also shorter than those offered by IBM, Kozinn claimed. On the System/34, for example, customers receive ordered equipment in about four to 12 weeks. If ordered from IBM, delivery for that machine takes 39 to 65 weeks, he said.

Datalease could not, however, offer any definite delivery times on IBM's System/38 — which IBM will begin shipping this June — except to say it will deliver in the fourth quarter of 1980.

Interface Box Turns TRS-80 Into Industrial Controller

DERBY, Conn. — An interface box that provides buffered I/O connections to Radio Shack's TRS-80 microcomputer for controlling, monitoring or testing external devices and circuits has been introduced by E&L Instruments, Inc.

The self-powered IF-100 plugs directly into the TRS-80's bus structure with an optional 40-pin cable and allows the machine to be used for "real-world" applications, a spokesman said.

The interface is controlled by the computer's Basic Level II software.

The IF-100 consists of a power supply, a logic probe for monitoring logic levels in I/O circuits, a device and memory decoder section, a bus section and a control section with signal buffering.

The device costs $150 in kit form and $215 assembled. The optional cable is priced at $25, the spokesman said E&L at 61 First St., Derby, Conn. 06418.

Controller Lets Series/1 Print Katakana

ORANGE, Calif. — MDB Systems, Inc.'s line printer controller for the IBM Series/1 can now transmit the 8-bit Japanese Industry Standard (JIS) code, enabling users to handle Japan's Katakana business language in addition to conventional Ascii and Ebcdic symbols.

The controller translates Ebcdic codes used by the Series/1 minicomputer to JIS codes, which are then output to the line printer.

The device is geared to operate with all models of Printronix, Inc. line printers as well as with Dataproducts Corp.'s Model 2530.

The controller costs $1,995 from MDB, 1995 N. Batavia St., Orange, Calif. 92665.

CSP MAP Gets Panel

BILLERICA, Mass. — CSP, Inc. has added to its Macro Arithmetic Processor (MAP) a programmer panel that provides direct visual access to information normally available only through software interrogation.

Designed to aid programmers in developing array functions, the panel facilitates the debugging of programs when used in conjunction with MAP Look and MAP Simulator diagnostics. The programmer can reportedly inspect the status of input and output queues as well as program counter-information for individual internal array processors.

Single-step control enables the debugging of control and non-array functions and permits system flags to be monitored for various conditions, CSP said.

The programmer panel is packaged for mounting above the array processor, plugging into the machine's CPU, host interface and arithmetic processor boards. It is offered as a system option at the time of original order or can be field installed for $1,500.

CSP is at 40 Linnell Circle, Billerica, Mass. 01821.

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Arthur Young Wants Reversal

CPA Challenges Trade Secrets Decision

By Marcia Blumenthal
CW Staff

MILWAUKEE — Arthur Young & Co. has challanged the landmark jury decision here last December that found the company, one of the nation's Big Eight accounting firms, guilty of stealing trade secrets from a Cincinnati-based information processing consulting firm.

If the circuit court here does not overturn the jury decision, as Arthur Young has asked, the accounting firm will file an appeal, according to Carl Liggio, general counsel for Arthur Young.

In a suit filed in 1974, M. Bryce & Associates, Inc. charged that Arthur Young stole a proprietary methodology Bryce developed for designing DP systems. Bryce's lawyer, Andrew Riteris, claimed the accounting firm learned about Bryce's methodology, packaged first in a manual and later automated and called Pride, during a presentation Bryce made to one of Arthur Young's clients, Harley-Davidson, a division of AMF, Inc.

After the jury decided in favor of Bryce, the Association of Data Processing Service Organizations, Inc. (Adapso) hailed the verdict as an affirmation of its position that service firms' proprietary systems are vulnerable to misappropriation by big accounting firms.

In the course of an audit, certified public accounting (CPA) firms send in their management services personnel to determine the effectiveness of the client's DP system. Because these employees engage in reverse engineering, Adapso contends, they can develop systems the same or similar to the ones they audit. This gives them an unfair edge in competing with smaller firms in the software and services industry.

Moreover, clients of CPA firms may be willing to switch to a CPA firm's consulting services, thinking they will get better service on their financial audits, according to Adapso.

In its suit, Bryce contended that after a demonstration Harley-Davidson liked the Bryce method, but had already agreed to the development of such a system by Arthur Young. When Arthur Young would not show Bryce the product it eventually developed for Harley-Davidson, the firm's president, Milton Bryce, said he became suspicious and subsequently filed suit.

In discussing the issues surrounding the case Bryce noted that trade secret protection is now the only way of protecting proprietary know-how. "How you control the design of system is the hot button in the whole industry," Bryce declared shortly after the jury handed down the $10,000 award.

(Continued on Page 68)

Western Electric Licenses Unix To Maker of Micro Systems

By Jeffry Beeler
CW West Coast Bureau

CUPERTINO, Calif. — Western Electric Co. has signed a licensing agreement that reportedly paves the way for the firm's Unix operating system to be implemented on the Zilog, Inc. Z8000 microcomputer.

The recipient of Western Electric's licensing arrangement is said to be Onyx Systems, Inc. here, a one-year-old manufacturer of Z80- and Z8000-based microcomputer systems for commercial, industrial and scientific applications.

Under the agreement, Onyx is reportedly authorized to supply Version 7 of the Unix operating system as part of the firm's C8002, a Z8000-based system slated for introduction in late May or early June.

The availability of Unix's Version 7 will give prospective C8002 users access to software features like Basic, Cobol, Fortran and a data base management capability, according to Onyx President Robert Marsh. Unix will also reportedly allow C8002 users to network their systems over high-speed, local serial links.

Aimed primarily at commercial and professional users with annual revenues of at least $4 million, the 16-bit C8002 will provide an upgrade path for customers of Onyx's C8000 family. In addition to the C8002, the C8000 line includes the C8001, a microcomputer system built around the Zilog Z80.

As the original C8000 series member, the C8001 incorporates a Z80 processor board and a memory card holding up to four 64K-byte random-access storage modules, for a total main memory capacity of 256K bytes.

To upgrade the C8001 to a C8002, users will simply supplement the Z80 board with a more recently introduced Z8000 processor board and increase the system's main memory to 512K bytes by plugging in an additional 256K-byte storage card.

Licenses for a four-user and eight-user Unix system cost $1,500 and $2,500 each, respectively. A typical 512K-byte C8002 hardware configuration will cost an average of $30,000.

The C8002 and its Version 7 of the Unix operating system will be available this spring from Onyx at 10375 Bandley Drive, Cupertino, Calif. 95014.

Mini Makers Focus on Security Despite Heist of Wang Chips

TEWKSBURY, Mass. — Even before the quick arrest of some of the people alleged to have perpetrated the recent $750,000 heist of semiconductor components from Wang Laboratories, Inc. here, major minicomputer makers in the area did not take the issue of security lightly.

It's not so much the dollar value of the loss from theft, but the risk of not being able to get the finished product out, Richard Pauley, manager of corporate security at Prime Computer, Inc., noted. Right now components are a high-priority security item that Prime controls on a weekly basis.

Like Wang, Prime employs an outside security force consisting of some 150 persons. "But it's the way you control it that makes the difference," Pauley emphasized. Prime does not stock all its components in one location and uses electronic devices to augment its security force.

Right after the Wang theft, Prime made a list of Wang's losses for its purchasing department, warning personnel there to be wary of a surge in component supplies.

Although Digital Equipment Corp. would not get too specific about it's security measures, a spokesman there said security is handled by "a formidable internal security force."

To avoid buying contraband chips, DEC has stringent purchasing methods, the spokesman added. This includes no spot buying from unknown sources.

At Data General Corp., security is also high priority but a spokesman declined to talk about security issues because, he said, to do so would give potential thieves ideas.

Because of their compactness and relative expensiveness, semiconductor chips have become attractive booty for thieves. Police in Sunnyvale., Calif., recently uncovered a stolen chip operation and recovered about $40,000 worth of components [CW, Jan. 28]. Last summer, police in Santa Cruz, Calif., uncovered a scheme involving the exchange of $37,000 worth of chips for cocaine [CW, July 16].

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Discussing Univac's new operations are, from left, William J. Murphy, Charles R. Williams and Dewaine L. Osman.

Univac Plans to Establish Two East Coast Operations

BLUE BELL, Pa. — To capitalize on its business growth in the eastern U.S., Univac is adding two marketing and service operations on the East Coast.

Northeast Operations, headquartered in New York City, and Mideast Operations, located in Wayne, Pa., will be established as of April 1. Both will handle Univac's complete product line.

In the past three years, Univac' computer bookings have increased 63% in the eastern region; doubling the efforts there will continue to increase sales, according to Charles R. Williams, vice-president and general manager of the Americas Domestic Division.

Under the reorganization, William J. Murphy, formerly the director of Northeast Area Marketing, will become vice-president of Northeast Operations and Dewaine L. Osman, previously vice-president of Eastern Operations, will be vice-president of Mideast Operations.

In Northeast Operations, one director will concentrate on the New York metropolitan area branches and another will be responsible for the remaining Northeast area comprising the Albany, Hartford General, Wellesley (Mass.) General, Milford (Conn.) General and Buffalo branches.

In the Mideast Operations, one director will be responsible for five dedicated manufacturing industry branches in Hartford, Wellesley, Montclair, N.J., Philadelphia and Milford. The other director will cover the Pittsburgh, Harrisburg, Pa. Philadelphia General, Arlington, (Va). and Baltimore branches.

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CPA Challenges Bryce Decision

(Continued from Page 67)

Under Wisconsin law, the award can total only the value of the product. Bryce said he has already spent about $250,000 to litigate the case; Arthur Young, he said, has spent close to $1 million.

In Public Domain?

Despite the decision in favor of Bryce, Arthur Young is continuing to maintain that Pride is not a trade secret and the contents of the system are in the public domain. Liggio pointed out that Bryce's own witness said during cross-examination that the information contained in Pride is found in the professional literature. Furthermore, the witness testified that an experienced systems designer could duplicate the system in 2,500 hours.

Answering the public domain issue, Bryce said curtly, "The ingredients for the Coca-Cola formula are all known; it's the way they are put together."

Among Arthur Young's other contentions is that Bryce put a copyright notation on all its documents. According to a 1964 decision, Sears vs. Comco, once the benefit of copyright is accepted, the author loses the benefit of trade secret protection even if he does not intend to actually copyright the documents, Liggio said.

The accounting firm also alleges that Pride was developed from an existing product called Ten-Fold that Bryce helped develop when he was an employee of Cincom Systems, Inc.

Pertec Votes to Merge With Triumph Adler

LOS ANGELES — Shareholders of Pertec Computer Corp. have voted to become a wholly owned subsidiary of Triumph Adler, Inc., the U.S. subsidiary of Triumph Werke Nurnberg AG of West Germany.

Triumph Adler has already acquired 97% of Pertec's outstanding common stock.

The headquarters for Triumph Adler, formed to consolidate its parent company's U.S. business equipment holdings, will be located at Pertec's corporate headquarters here.

Olympics Already Affected

Impact of Soviet DP Ban Unclear

By Bohdan O. Szuprowicz
Special to CW

The effects of President Carter's decision to ban exports of computer equipment to the Soviet Union in reaction to that country's invasion of Afghanistan will not be clear for some time.

While the wheat embargo appears to have the backing of most wheat-producing nations, it is not yet clear whether the other major computer producers — including France, the UK, Japan and Germany — will follow Carter's lead in the DP sales embargo.

The threatened boycott of the Moscow Olympics is probably the most serious measure that the Soviets would have to face among those already announced.

This is so because sports, politics and culture in all Communist countries are interwoven into an important social and propaganda infrastructure on which ruling Communist parties heavily depend.

Indirect Impact

The computer sales embargo already indirectly impacts the Moscow Olympics Games Committee, which is planning to use two IBM 370/148 systems to process the results of competition [CW, Jan. 28].

IBM was also seeking additional export licenses for permanent installation of the IBM CPUs at the City of Moscow computer center after these have done the job during the Olympics. Additional permanent export licenses for the City of Moscow are probably now out of the question.

Depending on the degree of completeness of actual hardware and software installation for the Moscow games, the Russians now face an immediate decision whether to complete the job at all costs using IBM 370 software-compatible Riad 2 machines now beginning production in the Soviet bloc or to redesign the whole computer system from scratch. This may be hard to do given only a few months before the scheduled beginning of the summer games.

End-User Guarantees

Another question that comes to mind is how the Soviets will observe the restrictions on use of Western computers already installed in the Soviet Union now that relations are so strained.

Since 1961 about 200 major Western computer systems have been exported to the Soviet Union from the U.S., UK, France, Germany, Japan, Italy and Sweden, mostly in the form of complete turnkey systems.

It is clear that an operation such as the invasion of Afganistan required significant logistic support of Soviet troops in the form of financing, fuels, air navigation and transportation. All of these activities are coordinated by various Soviet central ministries, many of which use Western computers.

Thus, the controversial end-user statements guaranteeing nonmilitary use of imported equipment can be said to have been all invalidated by a single decision of the Kremlin leaders, who seem to show little concern over whether or not the West will ever sell them its computers again.

In any Communist country, the ultimate decision on computer use, whether during peacetime or in war, rests with the party leaders. The Communist end user may sign whatever statements are required in order to satisfy the Export Controls Administration or the Coordinating Committee restrictions on paper.

But whatever their intentions, these users may also be directed at any time by the Central Committee of the party to provide goods and services to the military or police forces — using Western computers in doing so.

What this means is that credible end-user guarantees could only come from the politburos or the Central Committees of each Communist country in question. Not surprisingly, throughout the history of Soviet-bloc computer trade, no such guarantees have ever been given to any Western DP suppliers.

Independent Industry

The Soviets have been determined from the start to develop their own independent computer industry and to keep Western imports to a minimum. More often than not, these imports were intended to serve only as examples of Western innovation.

As a result, the Export Controls program has been nothing more than a method of creating and using some additional political chips. No market share of significance was ever expected to develop in the Soviet Union for any Western supplier.

So far, trade restrictions and embargoes failed to impair the development of Soviet military might and their expansion into various parts of the world. The determination to use even inferior equipment to attain strategic and political objectives is clearly more important than the possession of the most powerful number crunchers in the world.

Supershorts

Data General Corp. has established a business division responsible for marketing the firm's microcomputer and peripheral products through distributors, dealers, OEMs and retail outlets worldwide. This unit will be the single source and support organization for these products, which will be offered independently of other DG systems and products. The division is headed by William D. Jobe, formerly vice-president for North American sales.

Ramtek Corp. will market a financial transaction terminal systems jointly with Interface Systems, Inc. of Acton, Mass. The system, designated Model 8440, was designed as a low-cost solution to electronic funds transfer currently handled by teletypewriters from branch offices of large international banks. The system uses proprietary software developed by Interface Systems and a diskette-based Ramtek 8410 terminal.

The Computing Services Division of University Computing Co. has significantly expanded its remote computing capability with the acquisition of a Control Data Corp. Cyber 750 and an IBM 370/168.

Insac Viewdata, Inc., offering Viewdata service in the U.S. in conjunction with General Telephone & Electronics Corp. (GTE) has signed contracts with more than 20 large U.S. corporations including the Chase Manhattan Bank, J. Walter Thompson Co. and Time, Inc. Each corporation is installing one to five terminals connected via GTE Telenet Communications Corp. to the GTE computer center operating Insac's system in Tampa, Fla.

Harris Corp. has agreed to develop and market with a French firm a new kind of integrated circuit for telecommunications. The French firm, Telecommunications Radioelectriques & Telephoniques, will provide patented technology for the key part of the chip, the subscriber line interface circuit. In turn, Harris will develop, manufacture and market the chip.

Printer Venture Arranged

WALTHAM, Mass. — Dennison Manufacturing Co. and the Canada Development Corp. have agreed to develop jointly advanced, nonimpact printers. The arrangement also provides for the subsequent manufacture and sale of the equipment, which is expected to cost more than $20 million to commercialize.

The project centers around patented technology developed by Dennison's Advanced Development Group during the past five years. The first product to be developed will be a low-cost silent printer with an operating speed of about 50 page/min, according to Nelson S. Gifford, president of Dennison.

At Dennison, the initial application of the technology will be for the firm's high-speed, computer-controlled ticket printers for its retail systems.

For the next two years, funding for the project will be supplied by Canada Development, and thereafter the two companies will share equally in the profits and expenses of the venture, with Dennison retaining the right to use the technology for its current business lines.

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CDC DP Earnings Up 71%, Add 57% to Corporate Net

MINNEAPOLIS — Control Data Corp.'s earnings from the computer portion of its business rose 71% in 1979, producing $70.8 million compared with $41.3 million last year. With this sharp increase, CDC's computer business contributed 57% of the corporate earnings in 1979, compared with 1978.

Computer revenues for 1979 topped $2.2 billion, up 22% from 1978 revenues of $1.9 billion.

Corporatewide, total 1979 revenues reached $3.2 billion, up nearly 19% from $2.7 billion in the prior year.

Total corporate earnings were up 39%, reaching $124.2 million or $7.20 per share including extraordinary items, compared with $89.5 million or $5.17 per share for 1978.

However, fourth-quarter earnings declined 2% from 1978 levels, dropping to $23.8 million or $1.37 per share, compared with $24.2 million or $1.40 share in the same 1978 period. Commenting on the drop, Marvin G. Rogers, senior vice-president of finance, noted than an accounting change and higher research and development expenditures, including a sponsored grant of $2 million to the University of Minnesota (see related story), depressed earnings.

Revenues for the final quarter of 1979 were $949 million, up 23% from $769 million in the year-ago quarter.

IBM Declares Cash Dividend

ARMONK, N.Y. — IBM declared a regular quarterly cash dividend of .86 cents per share on common stock, payable March 10, to holders of record Feb. 13.

Frank T. Cary, IBM chairman, announced that the stockholders meeting will be held April 28 in Chicago at the Arie Crown Theater.

In recent years, IBM stockholders meetings have been held in San Diego, Denver and New York.

CDC Gives $2 Million Grant To University of Minnesota

MINNEAPOLIS — Control Data Corp. has given the University of Minnesota a $2 million grant — one of the largest ever received by the university — as a base toward establishing a Midwest regional center for microelectronics and information systems.

The center will operate through a collaboration of industrial, educational and governmental agencies. CDC was the first to support the regional center, but other corporations are expected to offer additional funding and support, a CDC spokesman said. Federal funds will also be sought to augment the program.

The university will administer the funds for the center, which will be organized by a board of representatives from the university and industry.

CDC also gave the university $300,000 to endow a visiting professorship in computer science. The person appointed to the position may be from education or industry and may either be from the U.S. or from another country.

"As a partnership of the private and public sectors, the center will be a major regional resource," William C. Norris, CDC chairman and chief executive officer, stated. The center will emphasize the conceptual aspect of research and analysis of ideas and alternatives relating to microelectronic science, the manufacture of microelectronics, computer design, computer applications and information systems.

CDC has had success with previous joint ventures, such as the Plato program, which was partially funded by a grant from the U.S. Labor Department, a spokesman noted.

Prime Reports Sales Gain 63%

WELLESLEY HILLS, Mass. — Prime Computer, Inc. reported fiscal year 1979 sales of $152.9 million, an increase of 63% over 1978 sales of $93.5 million.

Earnings for the year ending Dec. 31, 1979 were $16.9 million or $1.44 per share, an increase of 102% over the $8.4 million or 73 cents per share in 1978. The per share figures are adjusted to reflect two-for-one stock splits which occurred in June 1978 and June 1979.

Income figures include $1.2 million or 10 cents per share nonrecurring credit in the third quarter because of recent tax law changes in the UK.

Sales for the fourth quarter of 1979 were $48 million, an increase of 81% over the $26.5 million recorded in the corresponding period last year. Net income for the quarter was $5.1 million or 43 cents per share, an increase of 107% over the $2.4 million or 21 cents per share in the fourth quarter of 1978.

Prime attributed its high growth rate to the Prime 50 series, Prime Information Systems — directed at first-time users and sold through dealers — and its cooperative arrangements with software houses, which has increased Prime's visibility in the marketplace, according to a spokesman.

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Wafer-Fabrication Machines Seen Crucial to Semi Firms

By Jeffry Beeler
CW West Coast Bureau

NEWPORT NEWS, Calif. — U.S. semiconductor firms are staking their very survival on the ability of production-equipment manufacturers to provide dependable, durable and flexible wafer-fabrication machinery during the 1980s, an Intel Corp. executive warned here recently.

The immense difficulty of manufacturing ever-denser integrated circuits will spawn a new generation of highly sophisticated wafer-fabrication machines whose typical $500,000 price tags will make them the "Rolls Royce and Bentleys" of the semiconductor industry, according to Will Kauffman, Intel's vice-president of component production.

By 1990, the semiconductor industry's capital-equipment spending will total as much as $9 billion, compared with about $1 billion today and $100 million 10 years ago, Kauffman said at the Semiconductor Equipment and Materials Institute's Third Annual Information Services Seminar.

In short, by the end of the decade, a typical semiconductor manufacturer will have to spend up to 90 times more to start an integrated-circuit assembly line than it did in 1970.

Unabated Trend

During the last 10 years, capital-equipment spending has grown steadily in relation to the semiconductor industry's total revenues, and the trend threatens to continue unabated during the 1980s, Kauffman predicted.

By 1990, a typical integrated-circuit manufacturer will devote 25% to 35% of its annual sales to capital-equipment purchases. Today, by contrast, those purchases account for only about 15% of total revenues, and in 1970 they accounted for only 8%.

With billions of dollars of investments hanging in the balance, semiconductor manufacturers will have to make sure their future wafer-fabrication machinery lasts as long as possible and provides enough flexibility to adapt easily to the wafer-fabrication field's rapidly changing technology.

But the high cost of starting an integrated-circuit production facility will not be the only financial hurdle the semiconductor industry will have to overcome during the 1980s. Not only will the industry need more investment capital during the coming years than ever before, but it will also find the capital increasingly difficult to obtain, Kauffman said.

In the past, some semiconductor firms have sought to escape the ill effects of tight money supplies by merging with larger companies. During the next decade, that phenomenon is likely to continue as integrated-circuit manufacturers are forced to take increasingly drastic measures to finance their future growth.

Executive Corner

• Printronix, Inc. has named four new vice-presidents. Sam Kazarian was named vice-president of manufacturing, technical operations; Jerry King was appointed vice-president of human resources; Jack Schwarzenbach was named vice-president of quality assurance; and Selwyn Walker was appointed vice-president of the material department.

• Micro V Corp. has named James D. Wylie vice-president of marketing. A founder and former vice-president of Paradyne Corp., Wylie is now responsible for marketing and supporting Micro V's Microstar line of business computers both domestically and internationally.

• Pansophic Systems, Inc. has named David Parker vice-president of development and Timothy McBreen new product manager.

• Christopher Gray has been named vice-president of Manufacturing Software Systems, Inc.

• Software International Corp. has named Richard N. Gascoigne vice-president of its International Division. He joined the firm from Capex Corp.

• Raymond A. McFee has been promoted to vice-president of finance from the post of treasurer.

Semiconductor Makers Warned Of 'Programmer Catastrophe'

By Connie Winkler
CW Staff

NEW YORK — There will be a "programmer catastrophe" if semiconductor manufacturers do not integrate more systems into microcomputers, Intel Corp. President Andrew S. Grove said.

Meeting the increasing demand for computer applications will require one million programmers by 1990, but the total U.S. output of electronics engineers last year was 16,900. This is the potential "programmer catastrophe," Grove told the largest meeting ever of the New York Security Analysts recently.

The answer is to put future operating systems, input/output processors or features such as high-level language capability on one very large-scale integration (VLSI) circuit, Grove predicted. Intel is also working to reduce data base management systems to microcomputers, he added.

What will happen with VLSI circuits is similar to what happened to circuits in the 1970s. Manufacturers then were ordering custom-integrated circuits, and circuit designers could not keep up.

There would have been a "circuit designer catastrophe" if semiconductor manufacturers had not responded with wide-capability chips and ultimately microcomputers as alternatives to custom chips, Grove said. Intel's 8086 is a CPU on one chip.

Standardized Solution

"In the 1980s we have to replicate this change — we have to solve customer problems in a more standardized way," the author of a leading semiconductor textbook said. This is underlined by the increasing costs for customer application development which has risen per typical application from $300,000 development in 1970 to $500,000 in the 1980s to about $1 million by 1990.

Intel's objective is "to offer customers the world's highest performance VLSI, which can implement customer applications to solve customers' problems at the lowest possible costs," the Intel president said.

However, Grove warned the analysts that semiconductor manufacturers must spend a great deal on development costs in order to save the customer money. "The game is becoming more and more the game of large investment."

Grove generally hedged about the future of the classic high-technology success company, but he reported a leveling off in heavy demands for semiconductors.

"Customers aren't expediting us as they were six to nine months ago . . . The needs of the customer and our ability to produce are converging."

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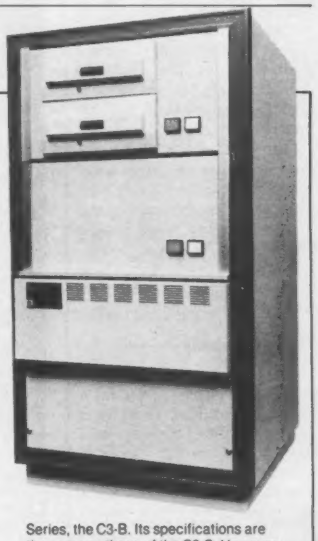

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In its normal configuration, the C3-C includes the Challenger III processors, 52K RAM, the 23 Megabyte Winchester drive and dual floppy drives for file system back up. And the cost is less than $10,000.

The CPU employs three microprocessors, the 6502, the Z-80 and the 6800. And the processor bus has been designed so new, more powerful micros (like 16 bit CPU's) can be added to the system later on.

There are also 10 open slots in the basic C3-C. The system supports up to 768K bytes of memory, in a multi user configuration.

The C3-B.
74 Megabytes. Under $13,000.
For those who require even more hard disk storage, Ohio Scientific offers another microcomputer in the C3 Series, the C3-B. Its specifications are the same as those of the C3-C. However, the C3-B offers a 74 Megabyte Winchester drive.

For those who do not need hard disk capacity now, but in all probability will need it in the future, Ohio Scientific offers the C3-A. It is like the C3-B and the C3-C in all respects but two. 48K RAM is standard in the C3-A, and it offers 12 open slots. When more storage is needed, the C3-A is easily expandable to either a 23 Megabyte or 74 Megabyte hard disk system. The C3-A is priced at less than $6,000.

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Contracts

Three Get Award For FAA System

WASHINGTON, D.C. — The U.S. Department of Transportation has awarded three competitive contracts totaling $12.8 million for the design of a system to automate the Federal Aviation Administration's (FAA) nationwide network of flight stations.

The awards went to E-Systems, Inc., which received $3.7 million, Logicon, which received $3.5 million, and Ford/Aerospace, which got $5.5 million.

Using off-the-shelf hardware, the three contractors must design a system that will provide FAA flight service specialists with weather and aeronautical information to brief pilots.

The FAA has specified that the final system must process and store the data for immediate callup on CRT screens at the specialists' stations. The system will eventually allow pilots direct access to the data by using terminals and dial telephones.

Currently, these flight service stations receive information by teletypewriter and from reports, but the FAA estimated this labor-intensive method will require 11,500 specialists by 1995 in order to keep pace with projected air traffic growth.

The automated system would permit the projected traffic growth but use no more than the current staff of 5,000 specialists.

The FAA will evaluate the competing designs, then select one contractor to provide a series of interconnected computers covering its 43 busiest flight service stations.

The initial production phase is estimated to cost more than $100 million.

Other Awards

Canada Systems Group Ltd. (CSG) has been awarded a contract for DP services from Traders Group Ltd. CSG will supply computing services valued at almost $19 million over five and one-half years.

Bunker Ramo Corp. has been awarded a $10 million contract by the U.S. Air Force Computer Acquisition Center for installation of a large turnkey Automatic Data Processing System to support the Air Force Electronic Warfare Center at Kelly Air Force Base in Texas.

Control Data Corp. has received a contract from the U.S. Navy for the lease and maintenance of a Cyber 203 supercomputer and a Cyber 170/720 system, with associated peripheral equipment, systems software and training, to process environmental information.

Lawyer for IBM Dies at 87

NEW YORK — Bruce Bromley, the IBM lawyer probably most responsible for the snail's pace of the U.S. vs. IBM antitrust trial and one of the last "characters" in the corporate bar, died Jan. 29 at the age of 87.

Bromley had been associated with Cravath, Swaine and Moore, IBM's law firm, since 1923.

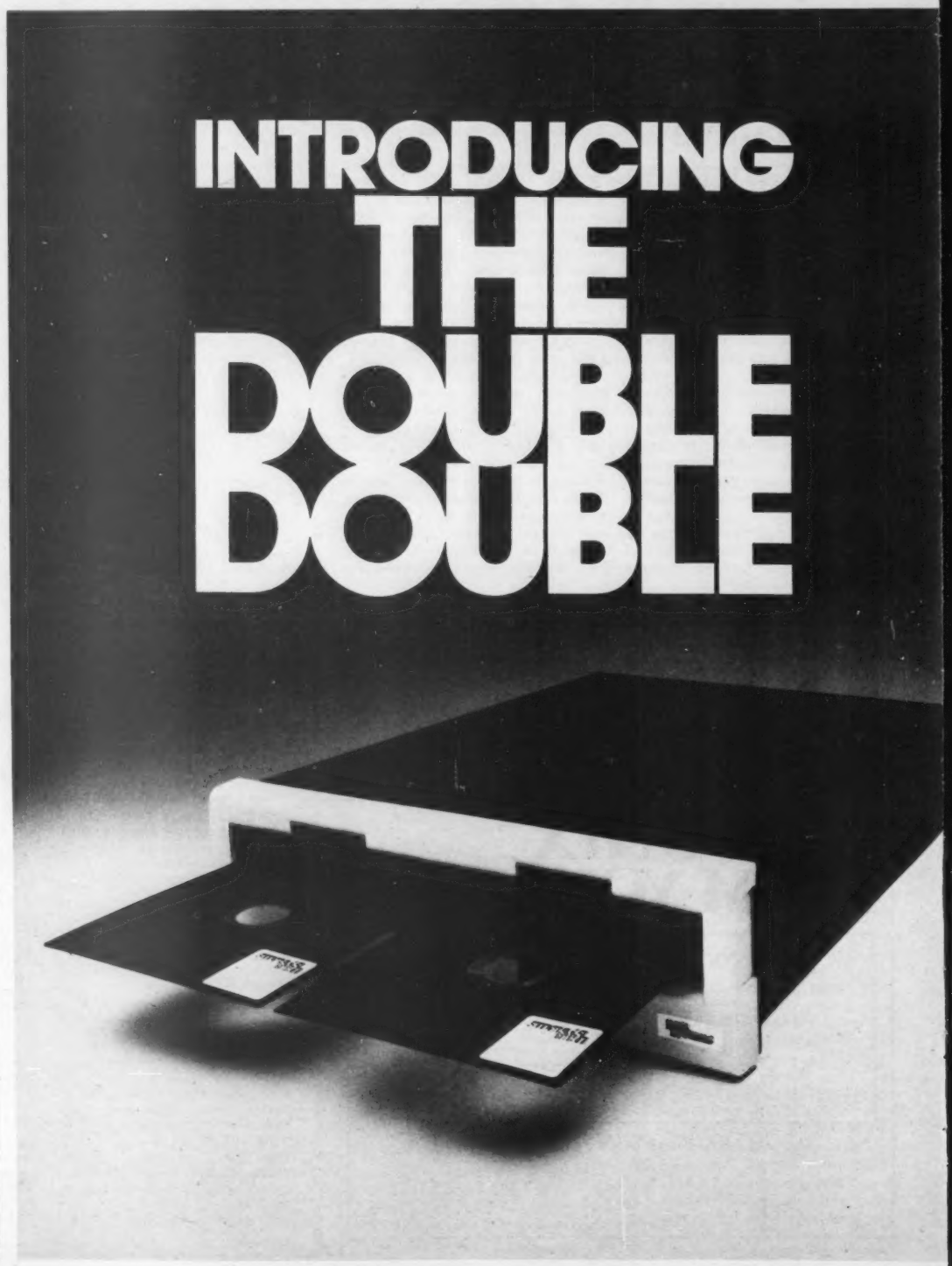
Given the nature of antitrust law, Bromley in 1958 told judges attending a seminar on protracted cases at Stanford University, "I quickly realized in my early days at the bar that I could take the simplest antitrust case and protract it almost to infinity."

IBM public relations personnel subsequently claimed Bromley was joking. Nevertheless, Bromley who guided IBM's antitrust strategy from the 1950s and signed its 1956 consent decree with the Justice Department, managed to drag the huge government monopoly case into its 11th year and fifth year of trial.

Until about a year ago Bromley would sit at the IBM counsel table in federal district court in New York, often reading a newspaper or doing figures on an electronic calculator.

Until the IBM case, Bromley's most successful stall had been a 1919 antitrust case stretched to 14 years and 50,000 transcript pages. U.S. vs. IBM is now bordering 100,000 transcript pages.

Born in Pontiac, Michigan, in 1893, Bromley graduated from the University of Michigan and, in 1917, from Harvard Law School. He served as an IBM director from 1958 to 1968 and thereafter as an honorary director.



Justice, IBM Argue Competitive Sales Figures

By Connie Winkler
CW Staff

NEW YORK — IBM had an 86% share of sales of large-scale processors during a six-month period in 1977, the U.S. Justice Department says, but in sworn testimony, IBM marketing executive John F. Akers contended those figures do not mean a thing.

Akers, IBM's key witness on competition in the U.S. vs. IBM antitrust case here, testified the figures the government used are an example of how IBM's commercial analysis department has consistently "underreported" competitive activity.

He further argued that many IBM systems recorded as sales never get installed.

Document Summary

The document used by the government was a summary of a more complete report originally presented to IBM's Corporate Management Committe showing changes in how commercial analysis recorded competitve activity.

Although Akers instituted improvements in gathering competitive information while he was president of the Data Processing Division (DPD) from 1974-76, the problem remains today, he indicated.

The document in question showed sales of Group I processors (such as the 3033, 370/158 and 370/168 during the six-month period in 1977. IBM sold 24.4 million points (a point is $1 of lease revenue per month) according to the report, while competing companies sold 4.8 million points. In the margin, the number 86% had been handwritten.

For Group II (370/148, 138 and 125) the review listed 7.2 million points vs. 3.2 million for competitors, with 70% handwritten in the margin.

IBM attorneys used the complete document to present a different picture to the court. Using figures and charts, they put IBM's install activity at only 38% of the market in that 1977 period.

They also showed IBM actually installed 60% of the points in Group I. Many products which a salesman originally records as sales are never installed, Akers told the court.

Through a series of hypothetical questions, IBM lawyer Ronald S. Rolfe showed the possible skew in the commercial analysis groups. If the entire system — processors and peripherals — is IBM, all the values are recorded in the processor category.

If the system includes an IBM processor and independent peripherals, the processor is still included in its category, but the peripherals, excluding terminals, are in the independent peripherals category.

Akers added that because the categories are distinguished by price instead of capability, a new 4341 processor with greater capability is in the same category as the 370/138 because it is the same price.

The 1977 competitive review was just one example of the gnashing of documents which drew Aakers' testimony to 12 days.

Justice Department lawyer Richard H. Boote also questioned Akers at length about the split in 1974 of the General Systems Division (GSD) from DPD to market small computer systems. Akers said the split was to provide better service and products to IBM customers.

The government argues the GSD split indicates IBM also distinquishes small and large computer markets.

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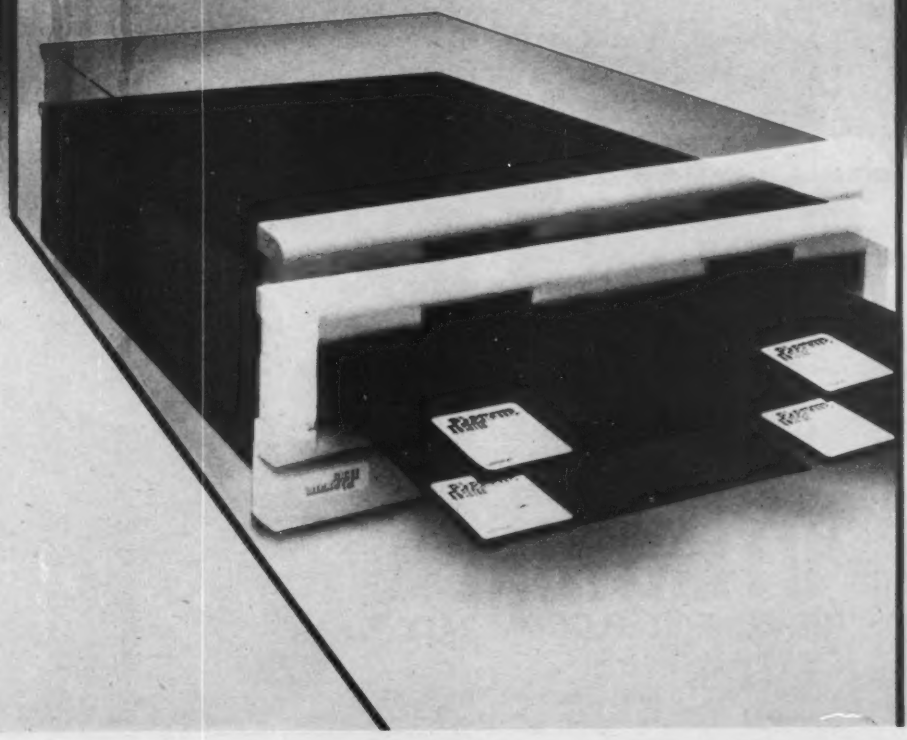

Nickels & Dimes

Magnuson Systems, Inc. has completed a financing agreement with the Bank of America that is reportedly in excess of $5 million. The firm anticipates sales of $10 million for 1979.

$$$

Computer Consoles, Inc. (CCI) has concluded an agreement with its banks resulting in a substantial reduction in financing costs. Retroactive to Sept. 1, $23.5 million of debt of Computer Consoles Leasing Corp., a wholly owned subsidiary, was converted from a revolving note with interest at prime plus .5% to a seven-year term loan with interest fixed at .25%. No compensating balances are required.

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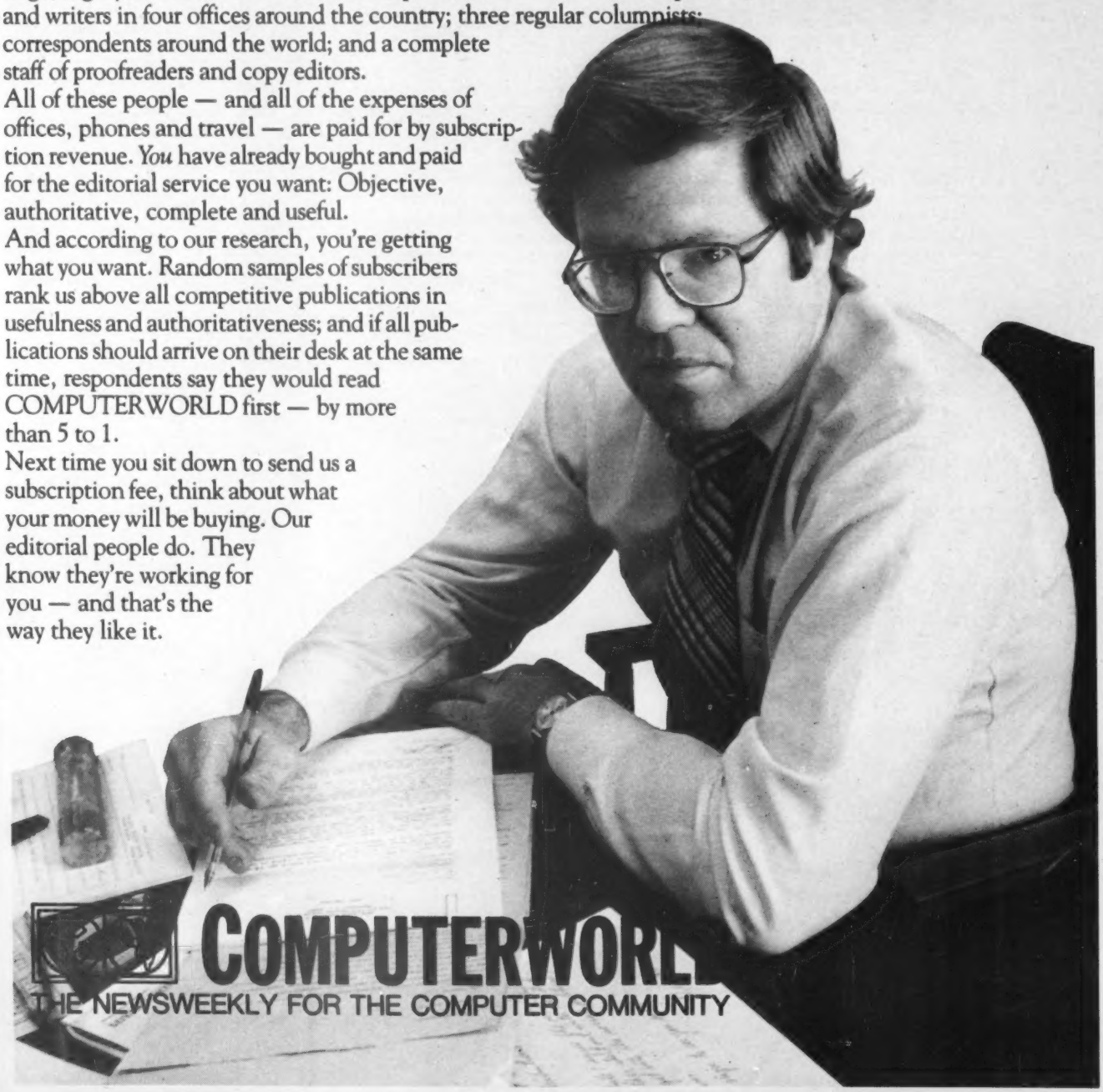


COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

position announcements

SAN FRANCISCO

Analyst/Programmers

The demand for COBOL professionals remains quite high. Experience in financial, manufacturing or distribution with 2 years' COBOL or ALC required. IMS is a big plus. Salary to 28K.

Systems Programmers

IMS or MVS experience. Salary to 34K.

Please send resume or call COLLECT:

COMPUTER RESOURCES GROUP, INC.

303 Sacramento St.
San Francisco, CA 94111
(415) 399-9535

3333 Bowers Ave.
Suite 130
Santa Clara, CA 95051
(408) 727-1650

Member of National Computer Associates. Offices Nationwide. Employers Pay All Fees.

SUNNY SOUTH!

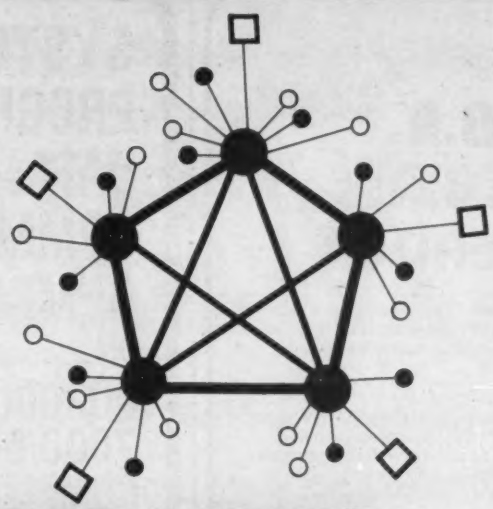
$15,000 to $35,000

- Programmers & Analysts (Cobol, Bal, PL/1, Fortran)
- Systems Programmers (OS/ DOS)
- Burroughs, Honeywell, Minis

We give personalized service! Fees paid by client companies. Send your resume to:

SEARCH E.D.P., INC

13773 N. Centrl Expwy
Suite 1305
Dallas, Texas 75243
Personnel Consultants



ATLANTIC OPERATION

provides a unique capability to GTE. In addition to our primary role as a major software/systems resource center for telecommunications, we are also responsible for the design of corporate-wide Software Development Methodology and implementation tools.

Our specialists in computer controlled telecommunications support GTE's engineering program to upgrade its telephone network through the use of state-of-the-art computer and digital data technology.

Our involvement includes telephone network support systems, packet switching networks, data communications protocols, automated coin toll service, automated bill calling and common channel interoffice signaling.

With distributed networks of mini-computers and micro-processor systems, our designs will provide enhanced real-time control, more efficient customer service and reduced operating costs.

Opportunities exist for individuals to support our expanding efforts in both telecommunications and software methodology. If you are interested, we invite you to contact us. Our compensation package compares favorably with the best in the industry and our educational program includes the opportunity for on-premise graduate study.

SOFTWARE/ SYSTEM ENGINEERS

Telecommunications System Engineers will participate in the specification of system architecture and translation of requirements into software/hardware specifications. Considerations include data transmission, network maintenance and management, centralized billing and improved customer service. You will also participate on task teams with other GTE organizations to develop requirements and specifications, and to prepare design and implementation plans. Qualifications should include in-depth experience in communications system engineering. Telephony background is desirable. BS/MS in Engineering or Computer Science.

Telecommunications Software Engineers will be responsible for analysis, specifications, design, development, test and maintenance of software involving man-machine interaction, communications processors, data base management, billing, switch maintenance and traffic data analysis. Requirements include several years experience in real-time interactive software system development; assembler, PL-1, PASCAL, RSX-11 programming capabilities and BS/MS in Engineering or Computer Science. Experience in telephony, simulation, process control or related applications is desirable.

Software Methodology Engineers with experience or capabilities in the methodology of software development, and interest in applying such knowledge to the establishment of an integrated computer aided and controlled system which will assist and guide the developer of software systems.

For further information please send your resume, including salary history, to Fred C. Brown at:
SYLVANIA SYSTEMS GROUP,
ATLANTIC OPERATION,
GTE PRODUCTS CORPORATION,
100 First Avenue, Waltham, MA 02154.

An Equal Opportunity Employer M/F

GTE Systems

COMPUTER PROFESSIONALS
3 WAY GROWTH OPPORTUNITY

If you are a people oriented problem solver and enjoy variety in your work, this three-way opportunity with a rapidly expanding client of ours is for you.
YOUR ASSIGNMENT WILL: • expand your professional base by offering a wide range of problems. • give you a unique chance to see systems from both business and technical viewpoints. • provide you with a creative group of people to work with.
Individuals with two or more years of programming or systems experience using high level languages on main frame or mini computers, to $35,000.

205 East 42nd Street, New York, N.Y. 10017
Send resume to: COMPUPLACE DIVISION OF WCSS PLACEMENT INC (212) 599-0400

PROGRAMMER ANALYST

Leading medical facility in Southwest is presently embarking on an ambitious development plan and needs experienced programmer analysts. New applications are being installed in a CICS-DL/1 environment incorporating distributed processing. Responsibilities include developing system specifications as well as coding and implementing applications. Applicants must have 3-5 years programmer analyst experience using COBOL. DB/DC skills and medical background a definite plus. Excellent benefits.

CONTACT:
Mildred Lewis
Employment Coordinator
Scott & White Hospital
3401 S. 31st. St.
Temple, Texas 76501
Call Collect: 817-774-2939
EOE

PROGRAMMERS AND ANALYSTS

Free Employment Service
Northeast, Southeast & Midwest U.S.

Scientific and commercial applications • Software development and systems programming • Telecommunications • Control systems • Computer engineering • Computer marketing and support.

Call or send resume or rough notes of objectives, salary, location restrictions, education and experience (including computers, models, operating systems and languages) to either one of our locations. Our client companies pay all of our fees.

RSVP SERVICES, Dept. C.
Suite 700, One Cherry Hill Mall
Cherry Hill, New Jersey 08002
(609) 667-4488

RSVP SERVICES, Dept. C
Suite 300, Dublin Hall
1777 Walton Road
Blue Bell, Penna. 19422
(215) 629-0595

RSVP SERVICES
Employment Agency for Computer Professionals

IMS

• LEAD D.B.A.
• SENIOR D.B.A.'s
• PROJECT LEADER

Hobart Corporation, a leader in the manufacture of commercial food equipment and KitchenAid appliances, with World Headquarters in Troy, Ohio, is seeking qualified individuals to become members of our Systems Assurance Department.

We have just initiated a 5 year applications development plan to design, develop and implement 8 major business and manufacturing ONLINE IMS DATA BASE systems. This effort requires the Systems Assurance Department to expand in order to support our 3 Systems Development Departments. This Department provides control, coordination, communication and assistance to all other MIS departments. Their responsibilities encompass Data Base Administration, Data Dictionary Design and Administration, Design Methodology and Standards Administration, Systems Development Quality Assurance, MIS Staff and User Training and Education, and MIS organizational development.

Our technical environment consists of an IBM S370/3033; MVS; IMS DB/DC 1.1.5; Data Dictionary 3.0; CICS 1.4; TSO/SPF; SNA-SDIC; and multiple IBM 8100's.

The candidates for the DATA BASE ADMINISTRATOR positions should have a BS Degree and 2-7 years IMS experience with at least 1-4 years as a D.B.A.

The candidates for the PROJECT MANAGER positions should have a BS Degree; 5-10 years data processing experience; supervision or management experience; and experience with Data Dictionaries, Design Methodologies and Standards, Data Processing Education and Training and Design Reviews.

If you are interested in joining an aggressive implementation and support team, send your resume and salary history or call **(513) 335-7171, Ext. 2212.**

James L. Severs
Manager, Staffing and Development

HOBART

WORLD HEADQUARTERS TROY, OHIO 45374

We Are An Equal Opportunity Employer M/F

SYSTEMS PROGRAMMING/ DATA COMMUNICATIONS/ GEMCOS SUPPORT ON BURROUGHS 7000/6000 COMPUTER SYSTEMS

Raychem Corporation, a high technology, growth-oriented International Corporation, with Headquarters in Menlo Park, California, is looking for qualified candidates to support systems software projects involving basic systems software, data communications, message and data networks (with GEMCOS) on the Burroughs 7000 series computer. Experience in DMSII, ALGOL, COBOL extremely desirable.

The ideal candidate will have a University degree, at least 5 years experience with large scale computer systems and excellent communications skills.

Positions are available in both
MENLO PARK, CALIFORNIA
And
BRUSSELS, BELGIUM

For immediate consideration, contact W. Gary Nolberg, U.S. Systems Support Manager, Raychem Corporation, 300 Constitution Drive, Menlo Park, CA 94025. (415) 329-4870. We are an equal opportunity employer.

Raychem

tear out this ad!

DATA PROCESSING PROFESSIONALS
South — Midwest

There are opportunities available that you should know about. Salaries moving up — new technology creating new challenge — expanding DP departments offering room for advancement. You owe it to yourself to keep up on what's going on in your market.

We can help. Fox and Associates is one of the South's leading recruiting firms, specializing only in DP. We can keep you informed on all new openings — advise you on your career development — and put you in contact with the right companies.

Whether actively looking or only curious, you will want to receive our regular newsletter, The EDP Generation. The January issue is now available and it's yours free of charge. Simply fill out and mail this coupon to:

FOX AND ASSOCIATES, INC.

233 Peachtree Street
Suite 2004
Atlanta, GA 30303
404/659-4141

1100 Main Street
Suite 1870
Kansas City, MO 64105
816/842-3000

Name _____

Position _____

Company _____

Home Address _____

City _____ State _____

Zip Code _____ Telephone _____

MANAGER, ADVANCED SYSTEMS SOFTWARE

Boulder, Colorado

Cray Laboratories, manufacturer of the world's most powerful super computer, has created a new position in its Boulder plant for a Manager of Advanced Systems Software.

Primary responsibility will be to recruit and direct the advancement of state-of-the-art in multiprocessing operating systems software.

Candidate should have at least five years experience managing a software design and implementation group and possess a PhD in Computer Science or equivalent. The successful individual will be a self-starter, able to work relatively independently, have advanced communications skills and be able to meet deadlines.

The position will result in major contributions to the design of multi-processor software for future Cray systems.

Cray Laboratories offers a challenging work environment in a university town with year-round recreational activities and a location surrounded by the Rocky Mountains.

Outstanding salary and exceptional benefits await the qualified candidate. Please send complete resume and salary history in confidence to:

Robert C.W. Biro
Cray Laboratories, Inc.
5311 Western Avenue
Boulder, Colorado 80301

An Equal Opportunity Employer M/F

CRAY RESEARCH, INC.

★★★ WANTED ★★★

Software Professionals

We're on the lookout for people who fit this description:

- Highly-motivated - Looking for more $$$
- Are "stalled" in their current position
- Want their achievements recognized

★★★

EDP OPPORTUNITIES COAST TO COAST

Robert Half, staffed by EDP professionals for EDP professionals with 70 offices throughout the U.S., Canada & Great Britain, is the largest network of personnel consultants in the Data Processing field. And its establishment in 1948 also makes Robert Half the oldest. One call and you can search the local, national and international markets. All fees are paid by client companies, of course. The following is a partial listing of opportunities and locations:

LOUISVILLE

D.P. MANAGER

Manufacturing company is seeking an experienced Systems III Model 15D with CCP person. Strong RPG II background in a mfg. environment. Lots of growth in this co. Relocation and interview paid. Excellent benefits. Salary to $25,000.

SYSTEMS PROGRAMMERS

A Central Ky. corp. is expanding their D.P. area. They want you to join them in their expansion. IBM 370 OS/VM Cobol and Assembler. Relocation and interview expenses paid. Excellent benefits and a starting salary to $25,000.

D.P. MANAGER

Midwestern Co. is seeking a highly qualified Systems 34 manager with mfg. background. MACPAC is required. Degree is a strong plus. Will also consider System III 15 D experience. Excellent benefits and a starting salary to $27,500.

Tom Williams
ROBERT HALF
of Louisville, Inc.
580 South Fourth St.
Louisville, KY 40202
(502) 585-1751

SOUTHERN CALIFORNIA

LOS ANGELES

SR. PROG. ANAL. .....To $30,000

Manufacturing co. plans to upgrade to IBM 4331 or HP 3000. Opportunity to move up fast to D.P. Mgr.

Contact Duncan White
ROBERT HALF
of Los Angeles
3600 Wilshire Blvd. Ste. 1914
Los Angeles, CA 90010
(213) 386-6805

COMMERCE

PROGRAMMER ANAL. .....To $25,000

Honeywell 2200 client in COBOL OS 2000 needs 2+ yrs. experience in COBOL with financial applications. Opportunity to learn Basic on Wang computers.

Contact Bob Dack
ROBERT HALF
of Los Angeles
6252 E. Telegraph Rd.
Los Angeles, CA 90040
(213) 721-2197

ORANGE COUNTY

DATA BASE ANALYST .....To $23,000

DL/I, DOS, prefer OS IMS & previous track record with COBOL, CICS and COREDUMPS. Exp. going to DMS next yr.

Contact Gary Duniap
ROBERT HALF
of Orange County
2333 N. Broadway, Ste. 200
Santa Ana, CA 92706
(714) 835-4103

MINNEAPOLIS

DATA BASE CONSULTANT

New position with major int'l distributor in Mpls. The ideal candidate will have 5 yrs. IBM IMS consulting exp. Top dollars go to Source Library System UCC-10 Dictionary bkgd. Unique oppty! Salary to $30,000 range.

SYS/ANAL CONSULTANT

Are you a shirt-sleeve prof who likes to work with "New Systems?" Mpls firm needs Sys/Analyst with Strong Assembly, CICS, and OS exp. Rewarding position with constant challenge. Salary to High Twenties.

PROG/ANAL

Est mfr in Mpls has opening in D.P. due to promotion. Must 1-2 yrs prog'g. RPG II preferred. New Comp. Syst. installed by Fed. Salary to Low Twenties.

PROG/ANAL

Oppty in Fargo, N.D. with expanding distributor. Position seeks 1+ yrs RPG II Sys 3/15D bkgd; CCP a real +. Move to mgmt and total paid relocation possibilities. Salary to $20,000.

Kathi Grant
ROBERT HALF
of Minnesota, Inc.
2236 IDS Center
Minneapolis, MN 55402
(612) 339-9001

TAMPA

SYS PROG

Complete responsibility! DOS/VS-Sysgens-PFT's. $24,000

PROG/ANAL

Mfg appl in DOS/VS-on line a must-Cobol. To $22,000

PERF ANAL

Min 3 years exp doing it on 370 OS or MVS. To $26,000

BANKING

Burr or IBM-Min 2 yrs DDA-Instal Loans. To $20,000

PROG/ANAL

Natl Corp needs 370/OS with acctg appl exp-Cobol. $20,000

AUDIT

Any industry bkgd-Min 2 yrs exp and Cobol. $22,000

MINI PROG

Any mini-Assembler or Basic Cobol nice-good growth. $20,000

Stan Allen
ROBERT HALF
of Tampa, Inc.
1311 North Westshore Blvd.
Tampa, FL 33607
(813) 875-4191

PHOENIX

PROGRAMMER ANALYST

Large manufacturing company seeks programmer with 3 years RPG II and COBOL. Pleasant work environment, exciting applications and excellent future potential. Start $16,000 to $18,000 range.

Roc Rogers
ROBERT HALF
of Phoenix, Inc.
3550 N. Central Ave. #1504
Phoenix, AZ 85012
(602) 264-6488

BOSTON

SYSTEMS PROG.

Maj. electronics mfr. requires state-of-the-art sys. prog. to support an IBM 370/158 OS/VS installation. Interv. & reloc. exp. paid. Excellent oppty. for creative tech. specialist. Salary $25,000 range.

EDP AUDITOR

Leading fin'l. services org. seeks business-minded, results-oriented indiv. desiring to learn EDP auditing. Will analyze & recommend solutions to variety of EDP problems. Hi-visibility pos. with hvy. user contact. Salary $24,000 range.

SR. COBOL SPECIALIST N.H.

Established computer vendor seeks indiv. to implement a wide variety of special projs. Mostly new develop. work. Interv. & reloc. exp. paid. Ski country nearby. Salary $22,000 range.

CONSULTANT/PROG.

Highly respected software consulting firm seeks aggressive client-oriented prog. to implement wide variety of projs. IBM OS/DOS, COBOL, PL-1, BAL or DB/DC exp. desirable. Frequent perf. reviews & bonus pkg. Base salary $18,000 range.

MFG. DESIGN PROG.

Diversified internat. mfr. seeks sharp, detail-oriented indiv. to design, code & implement new develop. projs. Interv. & reloc. exp. paid. Unlimited growth oppty. Salary $25,000 range.

Gerry Battista
ROBERT HALF
of Boston, Inc.
100 Summer Street
Boston, MA 02110
(617) 423-1200

PROVIDENCE

SYSTEMS PROGRAMMERS

Several openings w/fast growth Mfg./Insurance companies. State-of-the-art environments. IBM OS/VS DOS/VSE CICS MVS skills needed. Take charge doer type of person. Min. 2 yrs. systems prog. exp. $20-$26,000.

SYSTEMS ANALYST

Local prestige Mfg. company seeks degreed sys. analyst w/ Mfg. systems exp. Growth to Project Leadership assured for good communicator w/strong technical skills. $25,000.

D.P. MANAGER

Fast paced Retailer w/PRIME 400 shop needs individual w/COBOL/RPG II expertise. Heavy on-line knowl. the key. Small shop but very professional. $25,000.

PROGRAMMER ANALYST

Growth to Systems Design possible in med.-size Mfg. company. IBM 370/125 just installed. COBOL expertise & aggressive attitude leads to project mgmt. Relocation paid. $22,000.

Dee Ecker
ROBERT HALF
of Providence, Inc.
400 Turks Head Bldg.
Providence, RI
(401) 274-8700

HARTFORD

NETWORK PLANNER

S. New Eng. oppty. to take chg. of plng. lg. IBM hardware/software environment. T.P. config., cost justification, installation, multi-vendor contact, etc. Salary to $27,000.

MFG. CONSULTANT

Min. 3 yrs. mfg./finc. design exp. qualifies for internal mgmt. ser's. position on CT. shoreline. Major client with div's. nationwide! Salary to $28,000.

SR. TECH SPEC'S

W. CT. oppty. for indiv's. with IBM syst. prog. and/or network plng. exp. to move into state-of-the-art environment with nat'l corp. To $27,000.

DATA BASE PLANNER

Min. 1 yr. exposure to D.B. oriented syst. qualifies for oppty. to grow into D.B. tech position in 1-2 yrs. To $24,000.

MIS DIRECTOR

Seek top D.P. exec. pref. with Burroughs, mfg. exp., to direct corp. info. systems staff. Indiv. must possess excellent mgmt. skills. Salary $40,000 range.

EDP INSTRUCTOR

CT. corp. expanding in-house educ. staff. Exp. with IBM. Hardware/software prod. highly pref'd. Client will consider exp'd. syst. anal/prog. with desire to move into new resp's. To $26,000.

SR. SYST. ANALYSTS

Opportunity for Burroughs trained indiv's to direct new mfg., mktg. projects. COBOL bkgrd. + min. 5 yrs. exp. qualifies for two openings. To $30,000.

Stan Durbes or
Paul Meissner
ROBERT HALF
of Hartford, Inc.
111 Pearl Street
Hartford, CT 06103
(203) 278-7170

BUFFALO

D.P. MGR.

Attractive small mfg. co. located in Southern tier of NYS has an interesting and challenging opening. Opportunity exists to take a combined in-house data center and outside service bureau and develop a statewide network of clients. Applications include acctg., mfg, and dist. Heavy tech. administration is req. $40,000

DATA BASE ANALYST

Take over responsibility for design & generation of IMS control blocks. Handle all daily and cyclical manuf. of data base. Major implementation project with profitable lg. co. in WNY area. Must be aggressively ambitious. Interface with corp. mgt. $28,000

PROGRAMMER/ANALYST

New applications have opened positions for experienced mfg. systems programmers. Small but growing syst. III shop will get involved with MRP, BOMP, IPICS. Shirtsleeve type environment will lead to dept. mgt. RPG II, CCP a must. $22,000

PROJECT MGR.

Opportunity for articulate systems analyst to define systems requirements for large scale business applications. Work along with line dept., non-EDP talent, to develop user oriented packages. Primary resp. will be in order entry and inv. control systems. Large IBM data center. $27,000

Pam Siegal
ROBERT HALF
of Buffalo, Inc.
1310 Liberty Bank Bldg.
Buffalo, NY 14202
(716) 842-0801

MIAMI

PROJECT LEADER

Large Corporation based in Miami is seeking 'up through the ranks' D.P. Professional. Must combine technical background IBM 370, CICS, DL1, VSAM with administrative skills. This is a leadership position which offers excellent benefits with regular salary reviews. Opportunity to join one of South Florida's most respected and prosperous corporations. Relocation and interview expenses paid by employer. Salary to $29,000.

Chuck Nell
ROBERT HALF
of Miami, Inc.
1395 NW 167th St.
Suite 100
Miami, FL 33169
(305) 625-5433

PORTLAND

PROGRAM/ANALYST

Senior, minimum 5-7 yrs. experience. 3 yrs. experience COBOL in OS/MVS, IMS environment. Prefer banking, S & L, or financial systems background. Client wants strong people. 100% fee paid.

D.P. MGR./OPR.

2-4 yrs. "hands on" system 32/34 experience. Requires RPG II OCL, and financial systems background. 100% fee paid.

Contact: Bob Clawson,
ROBERT HALF
of Portland
1 S.W. Columbia,
Portland, OR 97258
(503) 222-9778

CLEVELAND

D.P. MANAGER

Here's your opportunity to run your own shop. Top Fortune 100 company needs you to set up a system which requires heavy RPG II. At least 3-5 years experience on an IBM Sys 3, 32, or 34 with some background in supervision. Strong knowledge of accounting, manufacturing and inventory is a plus. Salary to $25,000

...Many more outstanding opportunities available.

Marcy Parker
ROBERT HALF
of Cleveland, Inc.
1367 E. 6th St.
Cleveland, OH 44114
(216) 621-0670

DENVER

CONSULTANT

Excellent ground floor position available with a progressive consulting group of nat'l. CPA firm in Denver. Must have at least 2 yrs. business systems design experience. Degree and good comm. skills required. Start $25,000 range.

PROGRAMMER ANALYST

Local division of FORTUNE 500 corp. has an opening for a programmer analyst with exposure to both online and batch systems. Must have proven COBOL skills in financial applications. Some CICS or BAL knowledge would be a real plus. Start $23,000 range.

There are many other good career opportunities currently available in the Rocky Mt. area. If you are interested in obtaining more information please contact:

Steve Newman
ROBERT HALF
of Denver, Inc.
2 Park Central
Denver, CO 80202
(303) 629-1010

ALBUQUERQUE

IBM LARGE SCALE

Several financial institutions in New Mexico have immediate openings for senior prog./analysts and systems analysts. IBM 370 OS or DOS in Cobol and/or Assembler. CICS and Teleprocessing. To $25,000.

NCR

Major New Mexico company seeks Asst. DP Manager. Requires exp. with NCR. 8450 in Cobol and Neat/3. Also on-line. To $25,000.

Dick Starnes
ROBERT HALF
of New Mexico
P.O. Box 3320
Albuquerque, NM 87190
(505) 884-4557

ATLANTA

PROG. ANALYST $25,000

Dynamic Corp. seeks tech. heavyweight. Must have: CICS, OS/VS, COBOL, BAL. Excellent shop using dual 3033's. Good growth opportunity.

SYSTEMS SUPERVISOR $30,000

Must Have: Supervisory exp. Heavy MVS, Total or Environ. Outstanding shop with good benefits, growth opportunity and location.

PROG/ANALYST $23,000

Good opportunity for person with: either System 3/15D, 32 or 34-RPG II background. Will do general business applications design and programming.

Ray Jennings
ROBERT HALF
of Atlanta, Inc.
3379 Peachtree Rd. N. E.
Atlanta, GA 30326
(404) 266-2153

PALO ALTO NORTHERN CALIFORNIA

COBOL PROGRAMMERS ANALYSTS .....To $26,000

If you have one year or more experience and want to move to a more sophisticated environment . . . take advantage of an exceptional market to upgrade your skills. IBM or Burroughs.

DATA BASE ANALYST .....To $32,000

You should have a working knowledge of at least two DMS, DL1, ADABAS, IDMS, CICS. Will establish/maintain data base.

RPG II MGRS. or PROG. .....To $25,000

System 3/15D shops can use YOU today!

EDP AUDITORS ....To $30,000

Excellent opportunity for senior EDP auditors.

SYSTEMS PROGRAMMER .....To $32,000

IBM 370, DOS or OS.

SR. SYSTEMS ANALYST $30-35,000

To design/develop large manufacturing systems. IBM or Burroughs.

Over 1000 positions in peninsula area are available in:

Banking
Manufacturing
Retail
Insurance

for Data Base Admin., Operations, EDP Audit Systems Programming, and Management from $12,000-60,000.

Rich Abreau or
Jim Dupre
ROBERT HALF
of Northern California
2 Palo Alto Sq. #212
Palo Alto, CA 94304
(415) 493-8700

ROBERT HALF

COLUMBUS

PROGRAMMER ANALYSTS

ATTENTION! ATTENTION!
You'll receive plenty of it in this local d.p. facility. Join this Fortune 50 company and you'll rub elbows with seasoned professionals in a people-sensitive working environment while working on challenging on-line development project. You'll receive full medical, dental and 100% tuition reimbursement benefits and attend state-of-the-art training classes on ivy league campus yearly. Persons hired will have a minimum of 1 yr. COBOL programming experience, undergrad-ate degree and want the best. Salary $17-24,000. Relocation paid if out of town. Interviews arranged quickly and confidentially. All inquiries welcomed.

MANAGER OF SOFTWARE SYSTEMS

Previous supervision, knowledge of OS internals, planning skills and ability to manage staff of five software professionals required. Dynamic, prestigious company. Salary $28-38,000.

Call Kasie Alexander
ROBERT HALF
of Columbus
88 E. Broad St. Suite 1150
Columbus, OH 43215
(614) 221-9300

BALT/WASH

OPERATIONS PLANNING CONSULTANT

BIG 8 firm offers fantastic growth opportunity for an OPERATIONS RESEARCH CONSULTANT with 2 years work measurement and plant layout experience. Low twenty range.

Call Leigh
ROBERT HALF
of Baltimore
217 The Quadrangle
Baltimore, MD 21210
(301) 323-7770

Call Karen
ROBERT HALF
of Washington
7316 Wisconsin Ave.
Washington DC 20014
(301) 652-1960

DAYTON

INTERNAL CONSULTANT

Mgr Co. looking for overachiever to act as internal consultant. Are you ready to accept this challenge? You will define systems needs, perform system design, systems development & installation. Your mfg bkgrd is needed compiled w/exposure to large IBM mainframes, OS/VS, DOS, IMS DATA BASE & good communicative skills. Salary to $24,500. For immediate response call!

SYSTEMS PROGRAMMER

Major Ohio distributor willing to pay the price for systems programmers with emphasis on exp, not degree. Do you have exposure to large IBM mainframes & the various operating systems? If so call ASAP. Salary $28,000, but for the right indiv. is negotiable.

SYSTEMS ANALYST

Do you have 1-2 yrs exp w/ on-line application and/or batch applications? This major Ohio utility Co needs indiv's with any of these areas of expertise: ASSEMBLER, CICS, COBOL, JCL. Excellent benefits. Salary to $22,000 Anxious to hire. Call to upgrade your future. Fees paid.

Lic DAPESA Member
ROBERT HALF
of Dayton, Inc.
First National Plaza
Dayton, OH 45402
(513) 224-0600

MILWAUKEE

DATA BASE ADMINISTRATOR

Knowledge of DL1? Exposure to CICS? Ready for a challenge? Become a DBA on a mid-size IBM with CICS. Growing company needs aggressive individual. $22-28,000

TECHNICAL SUPPORT ANALYST

Company with 370/158, OS/MVS, CICS needs shirt sleeve, take-charge climber with BAL who wants to be an internals super star. $25,-30,000

Dave Weiner/Stan Mundro
ROBERT HALF
of Wisconsin, Inc.
777 E. Wisconsin
Milwaukee, WI 53202
(414) 271-9380

NEW ORLEANS

FINANCIAL SYSTEMS ANALYST

Energy related firm. Solid bus & Sys design exp. To $30,000

SR. PROGRAMMER

Multi million $ fin'l firm. 2 yrs. app'l exp. Strong COBOL. Batch or on line. To $20,000

PROGRAMMER/ANALYST

Internat'l Mfg. firm. 2+ yrs COBOL exp. Excellent benefits. To $20,000

PROGRAMMERS

1+ yrs applications exp. COBOL or NEAT 3. To $18,000

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OPERATIONS ANALYST

OS/MVS, Utilities, strong OS JCL. TSO/IMS preferred.

SYSTEMS PROGRAMMER

CICS, SYS GENS in DOS. Going to 370/148 VM/VSE.

PROGRAMMER/ANALYST

2 years COBOL, 2 years Mini. Some supervision.

PROGRAMMER

Rural financial institution needs COBOL and/or Assembler.

SYSTEMS ANALYST

7-10 years experience in large systems, good communicator.

SR. PROGRAMMER/ ANALYST

Strong COBOL in IBM 370 OS, MRP and/or IMS.

SYSTEMS ANALYST

PL1 prefer IMS good user skills, state of art environment.

EDP AUDITOR

Degree, strong accounting with programming background…

DATA BASE ADMIN

2 years experience with CICS, OS JCL.

Call collect or send resume to find out about the above and the many other opportunities in the Bay Area which are available to people such as yourself. Management assumes all fees.

Jerry Anderson
or
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LEAD COBOL PROGRAMMER To $25,000

At least 3 yrs. COBOL. ISAM, VSAM, DOS/JCL desirable. Project responsibility for conversion to large 370.
SUPERVISOR POTENTIAL!

PROG./ANAL. To $27,000

Southeast U.S. location. 3 yrs. design and programming exp. in large IBM shop provides opportunity to grow in this "turnaround" situation.

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$27,000

Excellent career enhancement in STATE OF ART environment. 1+ years work experience programming in COBOL, BATCH or ON-LINE. Dual 370/158 and 3032. Benefits include 4 WEEKS VACATION and excellent bonus.
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Career position offers PROFIT SHARING, TUITION REFUND, MAJOR MEDICAL, 3 WEEKS VACATION and fully paid retirement. 2+ years BAL or COBOL programming and good interpersonal skills. Excellent growth potential in congenial working environment. STATE OF ART 370 OS with IMS and CICS.
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KANSAS CITY

MANAGER OF SYSTEMS AND PROGRAMMING

Assist strong director in development of new department. Responsible for hardware/software evaluation, new system development, and hiring of new staff. On-line developmental experience preferred. Salary to $30,000.

SYSTEMS ANALYST

Responsible for a newly created project team. Will be responsible for the hiring and staffing of the project team. Project team will develop an on-line data base orientated inventory control system. Salary to $25,000.

PROGRAMMER/IMS SPECIALIST

Four years in DP with ANSI COBOL required. Two years of IMS developmental work. Assume lead position on financial systems. Salary to $25,000.

PROGRAMMER

One year OS ANSI COBOL experience required. Excellent entry to top quality KC firm for the junior programmer ready to move into on-line. Sharp fresh grads with computer science degrees considered. Salary to $23,000.

ASSISTANT DIRECTOR

Large manufacturer searching for exciting operations orientated individual with strong organizational skills. Fast paced seven day 24 hour operation. Salary in high $20's.

SENIOR EDP AUDITOR

Stepping stone opportunity for the EDP auditor anxious to make career move with leading firm. Fast promotion to major management slot. Salary in high $20's.

DP MANAGER (SYSTEM 34)

This medium size manufacturer needs the hands on doer willing to make an impact. Manage two junior programmers in the development of manufacturing systems. Salary to $30,000.

SENIOR SYSTEMS ANALYST

Take charge over staff of 20 with responsibility for new developmental work, budgeting, long range planning, and the implementation of new systems at divisional locations. Salary to $36,000.

SYSTEMS PROGRAMMER

Ground Floor opportunity to install a 4331 with a 4341 to follow shortly. Prior DOS/VS software experience required. Salary to $27,000.

SYSTEMS PROGRAMMER

Three years OS software with one year MDS support required. Will be in charge of MVS conversion. Salary to $28,000.

DATA BASE ADMINISTRATOR

Growing distributor has immediate need for solid IMS background. Total responsibility for the development of the DBA function and the staffing of the group. Salary to $27,500.

PROJECT LEADER

Degree and five years systems and project management experience qualifies you for the autonomous, corporate level position, in charge of the development of new financial systems. Salary to $30,000.

EDP CONSULTANT

Degree required with two plus years of design experience. Will perform feasibility studies, system design, and EDP audits for clients of this regional CPA firm. Salary to $25,000.

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LEAD SYSTEMS PROGRAMMER …TO: $34,000
International oil & gas co…3033's - MVS - IMS/VS - TSO - VSPC - SNA…large professional technical staff with a company that appreciates their technicians.

DBA …….TO: $32,000
Oil & Gas Co.…full responsibility and authority in a very large scale IMS installation…Multi CPU's…stable, growing, professional, politically free environment…one which is heavily committed to data base administration.

SENIOR SYSTEMS PROGRAMMER …TO: $28,500
Manufacturer…3033's…Develop large-scale state of the art peripheral software systems…One of the best tech staffs in this area.

SYTEMS PROGRAMMER …TO: $27,000
Financial co.…large, multi CPU DOS/VS - CICS - Power/VS shop …low-keyed, stable staff, growing installation.

PROJECT LEADER ……TO; $27,000
N. Dallas Manufacturer…requires experience in front-end manufacturing systems…CICS-DL/1… good long term situation with a solid company…degree required.

ALC PROGRAMMERS .TO: $25,500
Blue-chip insurance company anxious to hire professionals with tele-processing experience…Excellent opportunity for growth in a stable environment.

PROGRAMMER/ ANALYST ……TO: $25,000
N. Dallas Manufacturer…staffing new development systems group …MVS - TSO/SPF - CICS - DL/1 - COBOL…growth situation.

SR. PROGRAMMER/ ANALYSTS ……TO: $24,000
Blue-chip transportation company has ground-floor positions in a new large scale installation …Participate in design and implementation of an international teleprocessing network…Plush facilities.

SR. PROGRAMMER/ ANALYST ……TO: $24,000
Energy company…Participate in design thru implementation phases of new online 3032 system… Good growth situation.

PROGRAMMER/ ANALYST ……TO: $19,500
Blue-chip manufacturer…370/148 - DOS/VSE - COBOL - ACL …seeking career oriented DP professional for a new development effort utilizing CICS/VS and a remote terminal network… 4341's coming soon for implementing their long range DP plans.

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(214) 363-3300

SAN ANTONIO

APPLICATIONS PROGRAMMER

Must, COBOL, PL1, ALC on IBM 370-OS/VS 3033 MVS 1 Yr. Exp. required. $15,000

SR. SYSTEMS PROGRAMMER

5 Yrs. plus experience. Must ALC, OS/VS, Jes 2-Jes 3, IBM 370. $21,000

SR. SOFTWARE SPECIALIST

6 Yrs. Software or Applications Programming-2 Yrs. MVS internals. IMS, TSO or UTAM Plus. $26,000

PROGRAMMERS

2 Yrs. plus COBOL Programming-Banking or S & L applications any Hardware. IBM 370 DOS/VS or NCR 8230 definite Plus. $20,000

PERSON AVAILABLE

Manager of Manufacturing Planning and Systems Development. IBM 370-158 DOS, OS Environment COBOL, RPG. Mid $30,000.

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IDAHO distributor seeks prog/analyst. Burroughs COBOL DMS background preferred. To $24,000.

ALASKA bank needs prog/analyst. Prefer 2 yrs. Burroughs COBOL experience. To $24,000.

MONTANA insurance firm wants prog/analyst with 4 yrs. experience IBM COBOL, ALC or RPG. To $21,000.

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Washington

Information Systems Expansion. Eastern Washington based manufacturer in the process of expanding its corporate data center seeks professionals in a variety of disciplines including Scientific Programmer Analysts, Minicomputer Programmer Analysts and Business Systems Analysts. State-of-the-art environment includes real-time and interactive computing. To $26,000.

Programmer Analyst — Seattle Suburban Location. Rapidly expanding Seattle suburban data processing organization seeks a professional having at least two years of IBM 370 COBOL experience to work on a variety of accounting and financial information systems. Continued expansion provides excellent opportunities for upward mobility. To $22,000.

Senior Commercial Analysts— Consulting. Leading nationwide data processing services firm seeks professionals with distribution, manufacturing or government applications experience and exposure in a large-scale IBM or Univac environment. Rapid expansion provides excellent management promotion opportunities. To $24,000.

Minicomputer Programmer — Small Growing Environment. Progressive Seattle services firm offers substantial advancement potential for a PDP-11 RSTS experienced professional. Accounting systems knowledge desired. Will become a key member of a small but rapidly growing staff. To $23,000.

Systems Programmer — Gain Sophistication. Diversified Fortune 500 organization headquartered in a Seattle suburb offers state-of-the-art exposure to an experienced IBM 370 OS Systems Programmer. MVS/JES 2 sysgens, Internals desirable. To $29,000.

Systems and Programming Manager — Manufacturing. Highly profitable Seattle suburban organization has outgrown its present small system and seeks a proven Manager capable of planning for expansion. Experience in IBM distributed processing and manufacturing control applications preferred. To $32,000.

Sales Representatives — New Position. Rapidly growing Seattle suburban branch office of a nationwide computer services organization seeks experienced sales professional. Requires executive level selling ability. Outstanding new territory opportunity. Expected first-year earnings $45,000.

Scientific Analyst — Graphics. Highly regarded Pacific Northwest organization has created a new position to provide liaison between the computing and engineering groups. Heavy graphics experience required. Advanced degree preferred. To $30,000.

Systems Analysts — New Data Base Development. Expanding Seattle organization seeks professionals with manufacturing or financial applications background to assist in the planning of its first data base. Prior experience in telecommunications and distributed processing preferred. To $25,000.

Programmer Analyst — Energy Systems. Pacific Northwest organization which is a leading firm in the energy systems area offers the opportunity to work with large-scale financial, accounting and materials systems. Expertise with COBOL in a large-scale environment preferred. To $24,000.

Mini Programmer Analyst — Marketing Support. Seattle DEC OEM firm has openings for individuals who enjoy customer interface roles and have one to two years of experience with Basic Plus on PDP-11 RSTS. Some travel and an informal work environment provided. To $20,000.

Consulting Manager. Seattle office of a Big 8 CPA firm seeks a professional capable of directing its systems consulting activities. Exposure to a broad variety of commercial applications and line management experience required. To $35,000.

Oregon

Senior Analyst — Project Manager. Dynamic Oregon based firm seeks a key individual to assume responsibility for major projects in manufacturing, marketing and distribution applications areas from conceptualization through implementation. Organization growth will provide additional management opportunity. To $28,000.

Large New Developmental Effort. Hardware and software enhancements as well as significant business growth have created an ideal career environment within a well-known Portland organization. This state-of-the-art installation offers major developmental activities. Current openings exist for Programmer Analysts (to $23,000); Lead Programmer Analysts (to $24,000); Programming Supervisors (to $30,000); Systems Programmer (to $23,000); Systems Analysts (to $28,000); and Operations Manager (to $30,000).

Programmer Analysts — Internal Training Programs. Specialized Portland health care firm has multiple requirements for individuals with two or more years COBOL or BAL with financial applications. Company offers attractive technical and personal development programs. To $24,000.

Applications Supervisor — Leads to S&P Manager. Portland organization provides a clearly defined career path with both short and longer term potential. Initial responsibilities include a large staff with four direct reports, a multi-system environment and a seven-figure budget. Previously demonstrated management skills required. To $33,000.

Marketing Representative — Proven Software. Portland branch of a rapidly growing firm offers a unique opportunity to expand an Oregon territory vacated due to promotion. Knowledge of general business applications and proven sales background required. Excellent training and technical support provided. First year earnings potential $50,000.

Systems Analyst — New Data Center. Ground floor opportunity exists within a well-funded subsidiary of a major Portland energy firm which is virtually recession-proof. Three years of experience in general business applications required. To $22,000.

Major Corporate Expansion — Technical and Management Career Paths. Rapidly growing Oregon manufacturer is in the process of implementing a new three-year information systems development program. It currently seeks multiple computer professionals including Programmer Analysts, Software Specialists, Systems Analysts, Product Managers and a Marketing Manager. Aside from technical skills, potential for near-term management promotion essential. Salaries range from $18,000 to $30,000.

Systems Programmer — DOS to OS. International Portland based organization offers a significant opportunity for an individual with MVS systems internals experience to lead conversion of DOS to OS. Two years systems (software) programming experience required. Exposure to "DUO" and CICS preferred. To $28,000.

Senior Systems Analyst — Long-Range Planning. Aggressive, young financial institution seeks a key individual with project management skills to help develop a new five-year corporate information systems program. Portland location. To $30,000.

Programmer Analysts - New Systems. Continued growth of Fortune 500 company headquartered in Portland has created new openings for Programmer Analysts in manufacturing, financial and human resource applications areas. Requires minimum of two years OS COBOL and good interface skills. Provides good growth potential. To $25,000.

Network Analyst. Diversified Portland organization seeks a professional to join a new group in a state-of-the-art environment supporting a 1200 terminal network. Requires at least one year of OS/VS1 or MVS internals and good knowledge of evaluation tools. To $28,000.

Senior Systems Analyst — Corporate Interface. Portland Fortune 500 firm has major design and implementation requirements that require a professional having a strong project and design background. This position makes final proposals to Divisional General Managers and offers career path to line operating management. To $30,000.

Northern California

Programmers — Travel to Europe and the Orient. San Francisco Bay area based corporation is in the early stages of development on a worldwide order processing system and seeks professionals having at least two years of COBOL experience. Will participate in the design, implementation and installation of this network including travel to facilities located in Europe and the Orient. To $28,000.

New Development — Project Manager. Leading San Francisco based firm seeks a professional to lead one of the largest projects it has ever undertaken. Requires prior successful implementation of a large-scale, on-line data base system and good management skills. To $35,000.

Massive Data Center Expansion. Major San Francisco based company is dramatically expanding the staff of its new data center. Current new project efforts include both large-scale OS systems development as well as a significant effort in distributed processing. Openings currently exist at virtually all levels including Programmer Analysts, Systems Analysts, Project Leaders and Systems Programmers. Experience on either minicomputers or large-scale 370/OS equipment required. Starting salaries range from $18,000 to $40,000.

Communications Programmer — Software Development. Palo Alto based electronics firm seeks a professional to develop communications software supporting a new hardware product. Requires experience with communications software and line protocol with a preference for some minicomputer exposure. To $35,000.

DOS Systems Programmer. Nationally known San Francisco based firm seeks a professional initially to support the existing technical effort and then move into a technical long-range planning position. Requires four years of IBM DOS/VS experience with good knowledge of internals and ALC. To $30,000.

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West Coast Regional Headquarters
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Irvine, California 92715

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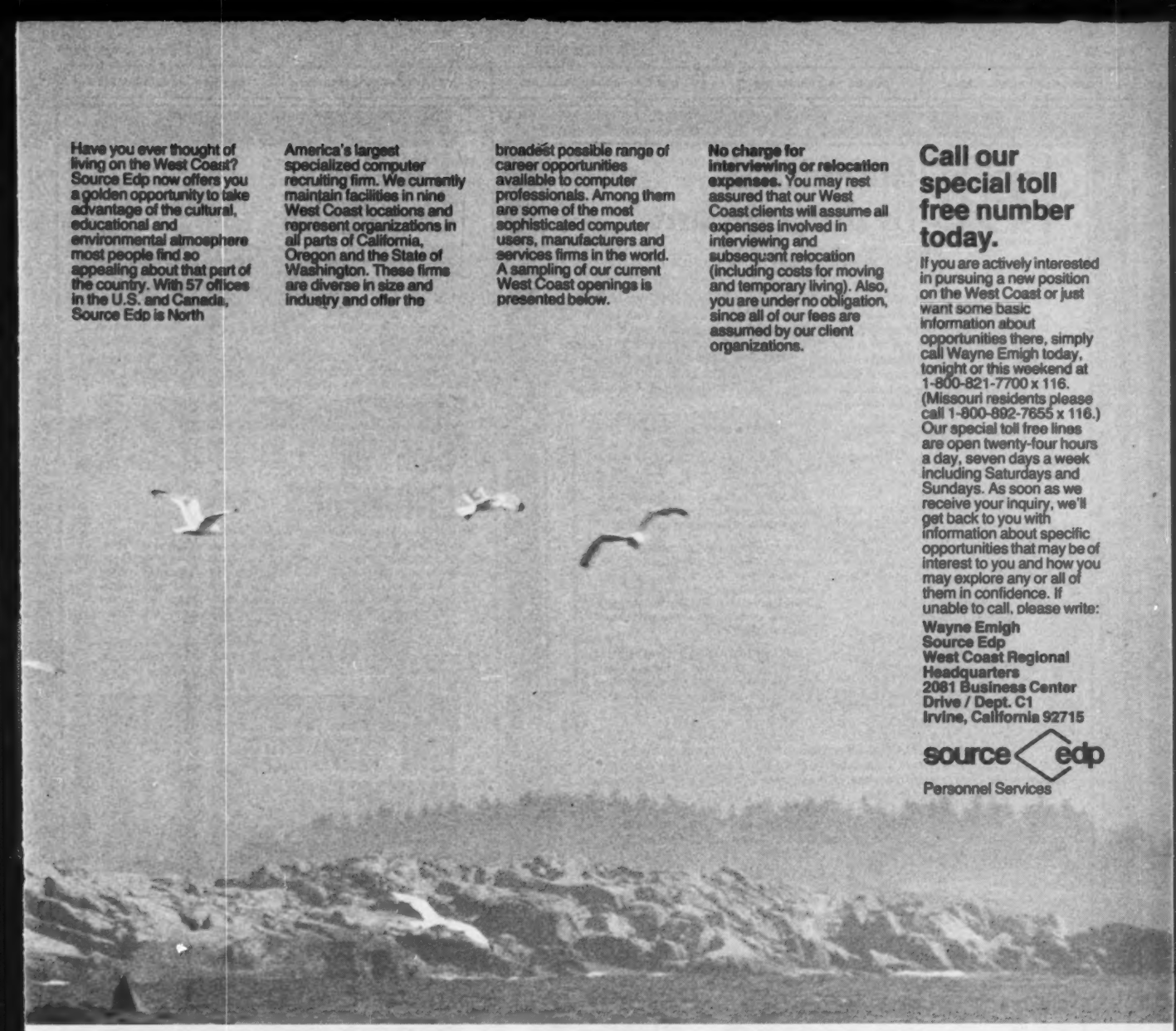

lines are open 24 hours a day, 7 days a week.

Southern California

Marketing Representative — $100,000 Potential. Dynamic growth (sales have doubled every year for the last four) has created a need for an experienced computer salesperson in the San Francisco Bay area branch of a computer services firm. Average income for Sales Representatives in 1979 was over $40,000 and several of the staff earned over $100,000.

RPG Programmer Analyst — International Travel. Systems division of a San Francisco based firm seeks a professional with two years of RPG II experience and an interest in international travel. Will be part of a major new development effort. To $30,000.

Systems Programming Manager. San Francisco Peninsula based manufacturer seeks an experienced Manager to assume responsibility for all systems software activities. Requires five years of large-scale IBM OS systems programming experience and some supervisory exposure. To $45,000.

Scientific Programmer Analyst. One of the most advanced technical firms in San Francisco seeks a professional with FORTRAN experience and engineering systems background. To $30,000.

Programmer Analyst — Suburban San Francisco Marin County. New project development team working on an on-line data base (CICS) development project seeks a professional with IBM COBOL experience. To $30,000.

Manager of Diagnostic Programming. San Francisco Peninsula based firm has created a new position to keep pace with its rapid growth. Requires five years of diagnostic programming experience and some supervisory background. To $40,000.

New Corporate Data Center — Orange County. Fortune 500 organization is undergoing a major expansion and is in the process of centralizing all systems planning, programming, software and computer operations into a new corporate data center. The center, which is located in a highly desirable suburban Orange County area, will house the latest in IBM computer hardware and software technology including advanced data base, telecommunications, and distributed processing applications. Current openings include Programmer Analyst, Systems Analysts, Project Managers, EDP Auditors, System Programmers and Hardware/Software Planners. Starting salaries range from $18,000 to $35,000.

Programmer Analyst — Minicomputer Training. Dynamic and rapidly growing minicomputer manufacturer located in Santa Monica seeks people with solid Assembly Language experience to participate in the development of marketable software packages for its general purpose business minicomputers. To $35,000.

Data Communications Analyst — SNA. Successful energy company headquartered in Southern California seeks a Data Communications Analyst to design and plan new network systems. Exposure to IBM's SNA (Systems Network Architecture) and IBM DB/DC software desired. To $33,000.

MI Director — New Data Center. Progressive firm in the electronics industry seeks a proven Manager capable of building a data processing organization from the ground floor. Will select equipment, hire staff and set direction for successful and growing firm. Suburban Los Angeles community. To $40,000.

EDP Audit Specialist — Extensive In-House Training. Fortune 500 organization headquartered in Southern California seeks an EDP Audit Specialist experienced in designing accounting applications in an IBM OS environment. Training in auditing techniques and advanced computing provided. To $25,000.

Sales Representative — High Income. Orange County office of a leading computer manufacturer is seeking a Marketing Representative with a proven track record of selling business systems. The average income of its sales force last year was $50,000.

Programmer Analyst — Learn Data Base. Growing Los Angeles energy company seeks OS/COBOL Programmers who want to learn IMS and manufacturing applications. Presently developing new IMS systems for plant and building maintenance and shop floor scheduling. To $30,000.

Systems Programmers — Minicomputers. Successful Orange County minicomputer manufacturer seeks professionals with operating system, compiler, data communications, data base or microprogramming experience. Company is committed to developing and sustaining a complete line of state-of-the-art systems software products. To $35,000.

COBOL Programmer — Newport Beach. Well-known diversified financial services firm seeks a professional with a minimum one year COBOL programming experience. Outstanding work environment overlooking Pacific Ocean. CICS, IMS training provided. To $23,000.

On-Line Project Leader. Major manufacturing firm in Riverside seeks a Senior Systems Analyst to head up the development of new on-line systems using an IBM 370 CICS/VS system and a network of minicomputers located throughout the company's divisions and subsidiaries. To $28,000.

Data Communication Specialist. Excellent ground floor opportunity to support a new telecommunications network now being installed. Los Angeles based financial corporation is adding a parallel network to support new customer services. To $27,000.

Senior Minicomputer Systems Programmer — Interactive Graphics. Manufacturing company headquartered in San Diego has a requirement for an experienced PDP-11 Programmer who has worked on RSX-11M, RT-11 or IAS. Will be involved in a major effort to develop a state-of-the-art real-time system. To $26,000.

Executive Level Internal Systems Consultant. Large San Diego manufacturer seeks a professional familiar with current computer technology (hardware/software, data base, data communications systems and systems techniques). Involves extensive management and user interface. Will be responsible for establishing systems standards and reviewing hardware/software technology. To $29,000.

Multiple Career Path Opportunities. Major San Diego high technology organization with multiple large-scale computer systems, minicomputers and microprocessors is currently expanding its professional data processing staff due to projected business growth. Current requirements include Business and Scientific Applications Programmers with a proficiency in COBOL, ALC or FORTRAN; Systems Programmers with experience in OS/VS2/MVS, IMS or telecommunications; and Business and Scientific Systems Analysts to develop new systems utilizing structured design and IMS. Salaries range from $16,000 to $28,000.

RPG II Programmer — Management Opportunity. Consumer products manufacturer seeks an experienced RPG II Programmer Analyst with management potential. Installation includes a S/3/150 with a future upgrade to a S/38. Suburban San Diego location. To $22,000.

MVS Systems Programmer. Large San Diego based organization seeks a professional to assist in the upgrade to MVS utilizing multi-CPU's and a large network of terminals. The company is one of the most stable organizations in the San Diego area, yet one of the most progressive in keeping up with state-of-the-art technology. To $28,000.

Systems Analyst — Move into Sales. Opportunity exists for a Systems Analyst or Programmer Analyst to move into the challenging role of a Sales Representative for a fast-growing computer services organization. Qualified applicants must have the ability to work independently and interface with various levels of technical and management people. San Diego location. Estimated first-year earnings $35,000.

Systems and Programming Manager — San Diego. One of the fastest growing companies in its industry is seeking an experienced professional to direct its systems and programming functions. Qualifications should include experience in project management in a large-scale systems environment. In-depth knowledge of financial systems preferred. To $35,000.

Data Base Systems Programmers. International corporation with a development group based in San Diego is seeking qualified individuals with a background in any data base system such as IMS, IDMS, TOTAL, DMS or System 2000. This group is currently developing a new data base system for future generations of computer systems. To $35,000.

On-Line Programmers — OS Environment. Major San Diego based organization has several openings for On-Line Programmers to participate in a system utilizing a large network of terminals tied to one of IBM's latest computers. Selected candidates will work in an OS/MVS CICS, IMS environment. To $22,000.

Minicomputer Programmer — San Diego Suburb. Division of a Fortune 500 corporation seeks a Programmer Analyst proficient in any high-level language (e.g., FORTRAN, PL/1, ALGOL, or PASCAL) to work on a variety of minicomputers (including PDP-11 and HP computers). To $26,000.

Project Manager — Retail Systems. San Diego based retail organization seeks an experienced Systems Analyst who has had project development responsibility on business systems. Will direct the efforts of a team of other Systems Analysts and Programmers in the development of data base information systems affecting all company operations. To $25,000.

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And at HARRIS, DATA COMMUNICATIONS DIVISION, you'll be keeping company with our staff of professionals who are experts in the field of data processing. Your choice of HARRIS as "the company" where you can build a solid future, teams you and your career ambitions with a leader in state-of-the-art distributed data processing systems. Good "COMPANY" all the way around! Located in **DALLAS, TEXAS,** we are part of the constantly growing and popular **SUNBELT,** where the climate is mild, people are friendly, and you can enjoy both suburban living and city sophistication. Professional positions are available in the following areas:

SOFTWARE DEVELOPMENT PROFESSIONALS

Background should include experience in design and implementation in OPERATING SYSTEMS; ON-LINE INTERACTIVE SYSTEMS FOR IBM 3270 and 3790; HONEYWELL VIP's, or BURROUGHS TD 800; COMPILER DEVELOPMENT; DATA ENTRY SYSTEMS and MINICOMPUTERS. BS in Computer Science or related fields is required along with assembly language knowledge. Solid experience with minicomputer and microprocessor systems plus familiarity with structured design and programming techniques preferred.

SR. MANUFACTURING ENGINEER

BSEE with 3+ years design and manufacturing experience for development of specific product lines. Must be people oriented and have the ability to work well with all levels of company personnel.

PRODUCT ASSURANCE ENGINEERS

Hardware and software knowledge related to the computer industry and a BSEE or Computer Science Degree is required. Responsibilities will involve qualification of testing final products consisting of terminals and distributed data processing systems.

SYSTEMS ENGINEER

BSCS with MSEE or BSEE with MSCS required. 5-10 years hardware, software and system design experience in the computer industry necessary. Knowledge of real-time development and microprocessor hardware essential.

SR. PROGRAMMER ANALYSTS

BSCS or related field required. Must have 3+ years business application experience using COBOL on large IBM systems. Prior financial systems experience necessary.

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SYSTEMS ENGINEERS

Burroughs has immediate positions available for experienced systems engineers to work on the design and development of custom computer systems. Responsibilities include systems engineering for telecommunications, system synthesis and modeling, man-machine interface tradeoffs, throughput/performance analysis, risk analysis and hardware/software/firmware tradeoffs. These positions span the time from conceptual design through implementation.

Applicants should have a related degree and at least three years experience in disciplines related to data communications to be considered for these state-of-the-art programs.

SOFTWARE ENGINEERS

A major contract award has created openings for software professionals to work on a high technology message switching system to be implemented on a Burroughs microprocessor. Tasks would include design and implementation of a real time operating system, enhancement of a PASCAL compiler, P-Code interpreters, firmware, store and forward message switch applications and diagnostics. Knowledge of Burroughs 6700 System would be a plus.

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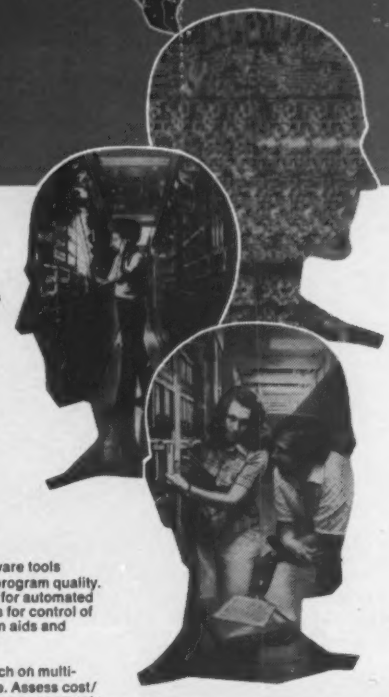

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Qualifications: Must have significant experience and formal training in data processing. Applicant should clearly have demonstrated competence as an instructor, planner, communicator, and counselor, as well as having shown a broad familiarity with structured methodology and project management.

Salary: 27K + based on experience and education plus a comprehensive benefits package.

Job: Instructor/Consultant Help develop and implement training programs for maintaining and improving DP staff members' technical and professional competence.

Provide training and consulting for implementation of Software Engineering (structured analysis, design, coding and project management).

Qualifications: Must have experience or formal training in data processing. Applicant should clearly have demonstrated competence as an instructor, communicator, and counselor as well as having shown an understanding of structured methodology and project management.

Salary: 25K + depending on experience and education plus a comprehensive benefits package.

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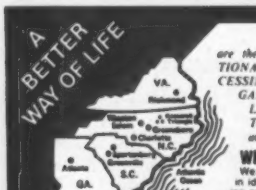

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EOE/M/F

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Wieboldt's, a leader in Retailing and Retail Data Processing Systems, is seeking a Data Processing Professional to manage its programming staff.

Qualified candidates should possess a minimum of 5-10 years experience in COBOL and BAL Programming using IBM equipment. An additional 2-3 years of supervisory level experience is required. Qualified individuals should also possess working knowledge of the following areas:

- DOS/OS
- DATA BASE
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In addition to an excellent salary and career opportunity we offer a full line of fringe benefits including pension and profit sharing. Send resume including salary history in confidence to:

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is seeking consultants for an EDP auditing staff. The individuals we seek should have computer science and accounting backgrounds and experience in EDP systems preferably in a manufacturing environment.

We are developing an audit function to evaluate 120 domestic and 15 overseas computer installations. Our program requires individuals who have systems and programming experience in computer-based financial applications and who possess the flexibility to travel. Previous EDP auditing experience is a plus.

If you feel you would like to be associated with a company that has experienced 108 consecutive quarters (that's 27 years) of increased sales, earnings and earnings per share, then it would be in your best interests to consider Beatrice your next and last employer.

Over 400+ profit centers look to the corporate staff to fill key management positions; therefore, the individuals we seek must have aspirations beyond the present.

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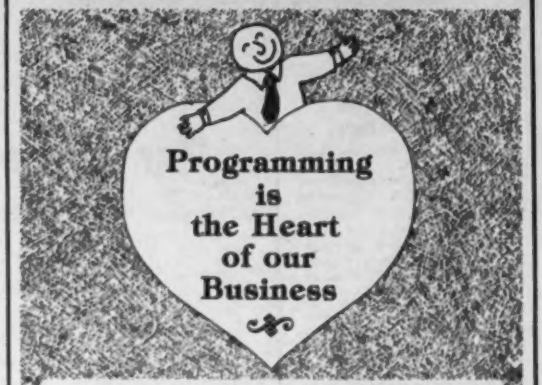
Mr. Fred Gillette
Manager, Corporate Employment

Beatrice Foods Co.
Two No. LaSalle Street, Chicago, Illinois 60602

An Equal Opportunity Employer M/F



Accordingly, we have developed a spectacular plan with superior salaries and benefits to attract and keep top-notch programmers. As an Allen Services employee, you will be a valued, integral part of a growing leader in Data Processing. We are a young, aggressive team, ready to offer you plenty of challenge and opportunity all across the nation. If you'd like to share in our unique financial services, bonuses, technical training in the near future on our in-house computer system, travel opportunity and unequaled benefits, call us now.

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PROGRAMMERS & SYSTEMS PERSONNEL

College Computer Center in mid-Manhattan seeks programmers and systems personnel with one-to-six years experience. We have several DEC PDP-11 series computers and offer challenging assignments. Applicants should have a knowledge of Basic Plus, Basic Plus-II, and RSTS/E. DEC Cobol would be a definite plus. Salary range from mid-teens to upper 20's, depending upon qualifications and experience.

Several positions are open. We offer liberal fringe benefits, six weeks' vacation and a good work environment. Please send resume, including salary history, to:

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Here — is fishing, sailing, golf, hiking, personal pleasures unlimited . . . and a cost of living that will make you smile.

Here — is our corporate offices, overlooking the Falls of James River. The view is beautiful. The challenges are inspiring . . . and on-going! . . . which is what you'd expect from one of the nation's most aggressive and innovative power companies.

Our continuing growth has created the need for an EDP Auditor with the proven ability to perform audit reviews of new and existing computer-based systems; consult with other audit units regarding EDP problems; and design & develop programs to meet these needs. A degree or equivalent experience is required, with six or more years background in a combination of auditing and systems design.

We offer a competitive salary and comprehensive benefit package. For prompt consideration, send your resume in confidence to:

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813-872-2631
Dept-C, P.O. Box 25434
Tampa, Florida 33623

Data Processing

Supervisor Hardware Planning International

Levi Strauss & Co. has an excellent opportunity available for a data processing professional to join their international technical support team working on the systems planning for our international affiliates.

Responsibilities will involve the planning, monitoring, measurement and evaluation of D.P. hardware for Levi Strauss International. In addition, you will supervise and coordinate delivery schedules and site preparation for equipment installation, making recommendations for lease vs. rental contracts. Initially based in San Francisco. May relocate to Europe in late 1980 for a 2 year assignment.

We require a BA degree or equivalent with a minimum of 6 years data processing background with experience in the monitoring and evaluation of hardware and operating systems. Candidate should be skilled in the development of performance standards and software systems development. Exposure to mini computers such as HP3000 hardware and experience with leasing agreements and the marketing of hardware desired. International experience would be a plus.

We offer excellent compensation plus a comprehensive benefits package including profit sharing and stock purchase plans. Interested candidates should submit resume with salary history to **Employment Department, Dept. KB-16, Two Embarcadero Center, San Francisco, California 94106.** We are an equal opportunity and affirmative action employer.

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Rogers and Associates is a leading data processing consultant firm. Due to continued expansion, we seek highly motivated individuals with strong backgrounds in programming or system analysis. Successful applicants will possess outstanding interpersonal and communication skills.

Openings exist in our U.S. offices at San Francisco and Los Angeles and our Canadian offices in Edmonton, Calgary, Regina, Vancouver and Victoria. Individuals should have at least two years of experience with business applications using any of the following:

- COBOL, PL/1, RPG II, BASIC-PLUS, MARK IV
- IBM 370 Series; OS, VS; TSO/SPF; IMS, CICS
- UNIVAC 1100 Series; EXEC-8; ECL; DMS 1100
- Honeywell 6000 Series; GCOS; TISS; TDS, IDS
- Burroughs 6700 Series; CANDE; DMS II
- DEC 11 Series; TOPS, RSTS/E; CCL, DBMS, RMS
- HP 3000; IMAGE, QUERY

Rogers and Associates offers an attractive salary and benefit program as well as planned personal development opportunities. If you possess the necessary skills and desire to pursue a career in consulting, we would be pleased to discuss your career plans in more detail.

Please reply in confidence to: Mr. Craig Collin

ROGERS & ASSOCIATES

Management Consultants Ltd.
4355 99th Street
Edmonton, Alberta T6E 5E4

2500 Wilshire Blvd.
Suite 712
Los Angeles, CA 90057

Managers

Digital Equipment Corporation's Educational Services Development and Publishing group is currently looking for talented individuals to fill four newly-created positions. These individuals will be part of a team whose task is to manage change within this organization. The Development and Publishing group is the engineering component of Educational Services, composed of over 500 people. Operating for 7 decentralized sites around the world, this organization is responsible for the development and publishing of a variety of training materials for both customers and internal people.

Operations Development is a newly formed group and offers high-visibility and excellent opportunities for career growth. Right now, we're looking for highly-motivated individuals who seek challenge to participate in the following areas:

Methodology • Responsible for the implementation of standards, policies and procedures, methods, models, and metrics.

Technology • Responsible for the evaluation and implementation of new technologies and methodologies.

Administration • Responsible for the ongoing analysis and preparation of operational and financial reports, including the identification of trends within the organization.

Special Projects • Responsible for the preparation of business plans and marketing studies, as well as for the project management of pilot programs.

Ideal candidates will have related business experience and an advanced degree, or equivalent, in a technical or management discipline.

If you are interested in, and qualified for, any of these outstanding opportunities, please forward your resume, complete with salary history, to Beatrice Kertesz, Digital Equipment Corporation, Dept K0211 3807, 12 Crosby Drive, Maynard, Massachusetts 01730. We are an equal opportunity employer m/f.

digital

Project Leader
Word Processing Applications Software

NCR's new development group in Columbia, SC offers total design freedom.

If you'd rather be defining a totally new WP system than coping with the limitation of some existing system, here's your opportunity. We offer all the resources, commitment and professional satisfaction you can ask for.

As the organization responsible for a giant computer company's entry into office Automation Systems, NCR Engineering & Manufacturing/Columbia gives you a chance to play a key role in a major new undertaking.

We are seeking a project leader who can be responsible for our new applications software group and architectural definition of Word Processing products. You will be overseeing the development of software modules and the Word Processing text editor. A detailed knowledge of data structures and text editing techniques is required — as is a background in the management and implementation of complex software systems.

Our location also offers notable attractions. Columbia is the home of the University of South Carolina, and we're within reach of the seashore and Great Smokies. Taxes are low and housing is affordable.

Please send full resume and confidential salary history to: Ken Uhlig, Word Processing Department J50, NCR Corporation, 3325 Platt Springs Road, West Columbia, S.C. 29169.

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As placement specialists to the computer industry in New England, our clients rely heavily on us to locate some of the most creative software personnel available to fill their key openings. Current, immediate needs are described below:

COMMUNICATIONS ENGINEER — **To 35K**
Design distributednetwork systems. Communications protocols and routing, polling and resource allocation experience essential. High level languages, especially PASCAL required.

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Provide both in-house and customer site software support, pre and post sale. Mini (PDP, Nova) operating systems exp. necessary. Excellent entree into marketing.

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Systems level software design of CAD/CAM applications exp. necessary. Requires assembly and at least one HOL programming exp.

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Openings exist for writers experienced in user manuals, operating procedures or marketing literature. Knowledge of computer architecture, operating systems or data communications required.

SOFTWARE SYSTEMS — PROCESS CONTROL — **To 25K**
Consumer products division; rural, low cost of living area. Design and install real-time process control system. Fortran essential, HOL preferred. Requires 1-4 yrs. related exp.

SOFTWARE TEST ENGINEER — **To 24K**
Program microprocessor debugging equipment for hardware testing. BSEE, logic knowledge, TTL, and 1 year of experience with PDP 11 req.

ASSOCIATE PROGRAMMER — **To 20K**
Multiple openings for BSEE or Computer Science grads. No exp. necessary.

If you would like further information concerning these positions, please call Dan Meagher at (617) 329-2660 or send resume to:

E.P. Reardon Associates

888 Washington Street
Dedham, MA 02026

Assistant Professor Computer Science

Full-time, tenure track (9 months). Starting date August 25, 1980. Ph.D. in Computer Science or allied field desirable. Strong liberal arts background, math teaching ability essential. Minimum salary: $15,400. Send letter of application, professional resume, names of three references to: **Dr. J. Michael Dunlap, Chairman, Department of Computer Science, Willamette University, Salem, Oregon 97301.** Selection process begins March 1. Application deadline is March 15, 1980. Equal Opportunity Employer. Women and minorities encouraged to apply.

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Applied Technology, a leader in defense warning systems, has immediate opportunities for skilled professionals ready to "move ahead" and keep their career path expanding and stimulating. Come join us now if you qualify for one of the following opportunities:

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Qualified candidate should possess 2-5 years' experience as a Systems Programmer in an IBM 370 OS/VS1 environment. Data communication and data base experience essential (CICS/VS, DMS, IMS-DB). Knowledge of VM/370, INTERACT a definite plus.

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Come join us in the Management Information Systems Department if you possess 2-5 years' experience in the design, development and implementation of Accounting or Manufacturing systems. Our environment is challenging and state-of-the-art: S370/158 with OS/VS-1, CICS/VS, DMS, IMS-DB and INTERACT. We require good working skills in one or more of the following languages: COBOL, PL/1, S370 Assembler. Data Base or Data Communication skills are a definite plus.

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For immediate consideration, please send your resume indicating position of interest to: **Professional Staffing, Applied Technology, 645 Almanor Avenue, Sunnyvale, CA 94086.** We are an equal opportunity employer, m/f. U.S. citizenship is required.

Itek Applied Technology

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Engineer

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Control Data Corporation seeks Field Engineers. Positions in:

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An outstanding opportunity now exists for an experienced Systems and Programming professional with a midwest based Fortune 500 manufacturing company. The ideal candidate will have an extensive systems development experience and significant management credentials. IBM IMS on-line and data base experience in a large scale environment is a must.

This is an exciting position in a growth environment. The Systems and Programming department is well funded with about 100 analysts and programmers presently assigned. Selected candidate will be expected to guide the further growth of this department in the years to come. Send your resume, in confidence, to:

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375 Cochituate Rd., Rte. 30, Framingham, MA 01701

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Senior Programmer Analyst

Perkin Elmer, Ultek Division, a leader in the manufacture of high vacuum and plasma deposition systems has an immediate opening for a talented programming professional. Reporting to the Data Processing Manager, you will be responsible for programming various applications in support of a manufacturing facility.

The successful candidate will have substantial manufacturing applications design and programming experience, preferably using IBM equipment, along with extensive knowledge of MRP systems.

If you desire a challenging opportunity in a dynamic, fast-growing organization, please send your resume including salary requirements to **Manager Industrial Relations, The Perkin Elmer Corporation, Ultek Division, P.O. Box 10920, Palo Alto, CA 94303.**

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Computer Programmer

Ferris State College has an immediate opening in the Administrative Computing Systems area. This position requires one year of experience and expertise in COBOL, ASSEMBLER and Data Base. Graduation from an accredited Data Processing Program may be substituted for experience. Our equipment is a 1½ meg IBM 370/145 running under VM. We are supporting DOS/VS and OS/VS1 with on-line application development. Send resume and references to:

Gordon G. Lewis
Director of Computer Center
Ferris State College
Big Rapids, MI 49307

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Director of the Computer Center

(Salary commensurate with qualifications and responsibilities). Responsible to the Executive Vice President for the management of personnel, finances, equipment, development, and implementation of programs, policies and procedures related to the entire operation of the campus Computer Center. Experience in development of hardware and software specifications for data base management. Equivalent to five years of progressively responsible experience, two years of which has proven management experience within a data processing environment, including responsibilities in supervision of personnel and budget planning and administration and managing the integration of hardware and software systems. Closing date: 3/21/80.

For official application contact the Personnel Office, California Polytechnic State University, San Luis Obispo, California 93407; (805) 546-2230. Affirmative Action/Equal Opportunity/Title IX/Rehabilitation Act of 1973 Employyr.

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  - Maintainability Analysis
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  - Reliability Predictions
- **DIGITAL TECHNOLOGY**
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  - Computer Architecture
  - Mini and Micro Computers
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  - Hardware
  - Software
- **GUIDANCE, NAVIGATION AND CONTROL SYSTEMS**
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Send resume to:

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We offer the challenge YOU'VE been seeking!

At Ford Aerospace & Communications Corporation on the San Francisco Peninsula, we have immediate opportunities for talented individuals who are capable of finding answers to software requirements.

SOFTWARE DESIGN — openings for engineers to translate software requirements into structured software design; define software interface requirements and data base structures; provide technical review and guidance to programmers involved in detailed development and installation of structured software. Direct experience is required in the development of real-time software for such functions as hardware control, data base management, information display, scientific analysis, and communications. Consideration will be given to applicants with training/experience with PDP/11 series hardware and RSX-11 operating system, as well as assembly language programming.

COMMUNICATIONS SYSTEMS — requires current knowledge of software architecture and software design of real-time systems. Network control system and terrestrial packet/voice/data switch experience desirable. BS in Computer Science or equivalent required; MS preferred. The ideal candidate will have experience with top down, structured design practices and is able to manage and participate in top down structured programming and test; ability to perform analysis of functional requirements, prepare data flow graphs, structure charts and throughput/peripheral I/O analysis. A demonstrated analytic capability for modeling and simulation of computer systems and software design is preferred; HP experience helpful.

Let us challenge your expertise. Send resume at once to Professional Employment, Dept. CK-154, 3939 Fabian Way, Palo Alto, CA 94303 — or call collect (415) 494-7400, Ext. 4144. An equal opportunity employer, m/f.

Ford Aerospace & Communications Corporation

Western Development Laboratories Division
3939 Fabian Way, Palo Alto, California 94303

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CSC

ALC PROGRAMMER ANALYSTS

The Applied Technology Division of Computer Sciences Corporation has immediate opportunities available for mid/senior programmer analysts with heavy ALC background to provide state-of-the-art communications support for NASA's Goddard Space Flight Center in Greenbelt, Md. (located midway between Washington, D.C. and Baltimore, Md.) using large scale IBM hardware.

We will offer highly competitive salaries to qualified candidates.

For prompt consideration or additional information, please call collect or submit resume to:

M. D. Hill
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Very competitive salary plus profit sharing. Other benefits include major medical, dental coverage and relocation expenses.

Send resume with salary history to:

Bob Hilton
LDBrinkman/Southeast
7475 Chancellor Drive
Orlando, Florida 32809

PROGRAMMER ANALYSTS

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Our firm has an immediate opening for an experienced Data Base Analyst or Data Base Administrator. A minimum of 3 yrs. programming experience in COBOL and/or IBM 360/370 assembler language and 3 to 5 yrs. experience in IMS DB/DC environment is required. The successful applicant must:

- Be knowledgeable in these areas of IMS: Utilities, Data Base Design, Data Base Recovery, Performance Evaluation and tuning.
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Salary $35,000+ with an excellent benefit package. All resumes will be held in strictest confidence.

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SYSTEMS PROGRAMMERS
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We are a well-established German software house.

Due to increasing project load (we work on a few of the most exciting projects in Germany) we are now seeking experienced systems programmers with a minimum of 5 years experience on **IBM, UNIVAC, OS, MVS,** or similar systems and BAL and high level languages.

In depth of knowledge of **SNA** and/or similar concepts would be especially appreciated.

Knowledge of German will not be essential, however every encouragement will be given to those wishing to learn the language.

Salaries in range
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Mr. Beck will arrange for interviews with you in February or March 1980, at a convenient place for you in USA.

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This senior level manager will develop specific marketing and product plans, coordinate efforts of Marketing, Research & Engineering, and analyze and develop new business opportunities.

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To provide Telecommunications Product Management, technical assistance, including multi-location options. Position involves specification development, implementation and support of communication packages that allows word processing devices to communicate with computers. Position requires heavy interface with major customers, Product Planning, R&E, Technical Service and Sales Training Departments.

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A. B. Dick Company offers an excellent salary and comprehensive benefits package. For confidential consideration, please telephone (312) 647-8800, Ext. 2723 or 2581, or submit a detailed resume with salary history to:

PERSONNEL MANAGER,
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Our Corporate Data Center is in Greenville, South Carolina, listed by Fortune and Money magazines as one of the nation's top growth areas. We also have remote computer sites in Houston, Texas and Research Triangle Park, North Carolina.

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Personnel Director

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NO AGENCIES PLEASE

PROGRAMMER/ ANALYST

We are looking for a Programmer/Analyst with experience in commercial applications in an on-line data base environment.

Must have 2–3 years' COBOL programming experience preferably with a Burroughs medium system.

We are the 500-member staff serving 150,000 members. We offer a professional environment, many paid benefits, good working conditions and an excellent career potential. Send resume including earnings history and required salary to:

Ms. Silvia Mihalic

AMERICAN INSTITUTE OF
CERTIFIED PUBLIC ACCOUNTANTS
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New York, New York 10036

An Equal Opportunity Employer

Data Processing

Programmer/ Analysts City of Naperville

We have openings for several data processing professionals. The qualified candidates will have 1-2 years experience with RPG and possibly CCP. To the qualified candidates we offer a competitive salary, excellent employer paid benefit program, full tuition reimbursement program and a congenial working atmosphere. Please send your resume with salary history in confidence to:

PERSONNEL OFFICE
CITY OF NAPERVILLE
175 West Jackson Ave.
Naperville, IL 60540

Equal Opportunity
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COMMUNICATIONS PROFESSIONALS

are communicating with

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Talk is cheap, but communicating is another story. At MPI, we take what you say seriously. As specialists in the recruitment of communications personnel, we know that the exchange of ideas with people at all levels of the communications world is what gives us our unique position. It's what enables us to judge whether an individual is right for a particular company, and when a company will fulfill the expectations of an applicant.

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Ideal candidate should have thorough knowledge of IBM 3705/3270 processors. Protocols include BISYNC, SDLC & X.25. Will be responsible for planning, coordination & installation from project initiation to live cutover of major data center.

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Knowledge of TELCO offerings & private systems. Will assist in planning new systems, writing orders, evaluate & make recommendations, & cost reductions. Some familiarity with tariffs is essential.

For confidential interview, Call or Send Resume To:

MPI systems, inc.

Tony Hedman/Nancy Watine
MPI systems, inc.
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New York, N.Y. 10036
(212) 840-7800
(agency)

PROGRAMMER & PROGRAMMER ANALYST

Datapoint Corporation, the pioneer leader in dispersed data processing has career openings for COBOL programmers and programmers analysts in our San Antonio office.

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We are an equal opportunity employer M/F.

DATAPOINT

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Bakersfield, California, based farming company seeks Programmer/Analysts to assist in a five year development plan involving the automation of a variety of farming related systems. Applications will be written in Cobol to operate RJE to a IBM 370-158 Operating System running under MVS.

Minimum three years experience as a Programmer/Analyst and be proficient with Cobol and OS-JCL. VSPC and Panvalet along with Structured Analysis, Design, and Programming techniques helpful. Send resume and salary desired to Personnel Dept., P.O. Box 9594, Bakersfield, CA 93389. Equal Opportunity Employer

PROGRAMMER/ANALYST

Farming company based in Bakersfield, California, seeks Programmer/Analyst to maintain and develop RPG-11 applications for IBM System 32 and 34. Excellent benefits. Send resume and salary desired to Personnel Dept., P.O. Box 9594, Bakersfield, CA 93389. Equal Opportunity Employer

MIAMI-DADE COMMUNITY COLLEGE

Programmer IV

A programmer IV generally works independently to analyze problems in terms of systems and programming requirements; codes, debugs and documents programs. Minimum experience required: 2 years experience in computer programming. An Associate Degree in data processing.

SALARY RANGE: $15,992 - $21,311

Submit two copies of detailed resume to: **Miami-Dade Community College, South Campus, 11011 S.W. 104 St., Miami, FL 33176.**

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Don Harris,
Bonnie McKee
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811 SW 6th, Suite 710
Portland, OR 97204

Bill Ingrig
(206) 623-6790
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Seattle, WA 98121

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Our Information Systems Services Group is seeking an experienced, professional Systems Programmer capable of evaluating and installing new software products, analyzing software performance, evaluating hardware capacity and providing technical assistance in operations and applications areas.

In addition to a salary and benefits which will fully reflect your experience and ability, you will have the opportunity to cross-train in VM. Our future includes a sophisticated teleprocessing network, several new software packages and a 4341. We are located on Nob Hill in San Francisco. If you have a background sufficient for the position, here is an opportunity to join an established technical support staff. Call or submit resume to: **P.J. Enright, Technical Support Manager, CP National Corporation, 600 Stockton Street, San Francisco, California 94108, (415) 986-0433, ext. 263.**

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You'll be based in Houston, but from time to time you will be required to travel to vendors in the U.S. and to field sites in Saudi Arabia.

Interested? Send us your résumé and we'll get back to you very soon. Write: Aramco Services Company, Section DOM, Dept. CW021180JSA, 1100 Milam Building, Houston, Texas 77002.

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Applicants should have a minimum of nine (9) years experience in a Field Service position with a proven track record in organizing, managing, and directing field service activities.

C3 offers a competive salary based on experience along with a comprehensive benefit package.

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C. Ed. Hall
Manager, Human Resources

Husky Oil Company
P.O. Box 380
Cody, Wyoming 82414

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Compensation ranks with the best in the industry. A liberal benefit package includes:

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Will be responsible for managing the development of designs furnished by R&D Engineering Group into manufacturable products meeting the highest standards of functional performance and reliability. Qualified applicants must have BS or MSEE, 12-15 years experience in digital and analog circuitry as applied to the computer industry, knowledge of communications theory and equipment, understanding of all phases of manufacturing and 2-3 years experience supervising a technical group.

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Responsibilities encompass design and implementation of computer systems to support corporate information needs. Requires 2 or more years experience as a project manager or other senior position with complete project management background. Should also have 5 years systems analyst and design experience. Degree in economics, accounting or finance is essential; an MBA is preferred.

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Wide responsibilities for identifying key user management problems and information requirements and making appropriate recommendations to departmental heads. Requires 2 or more years experience as a senior systems analyst, 3 or more years in systems analysis and design. Strong business and technical background and understanding of management process is essential; supervisory experience is a plus. A degree in finance, accounting or economics is essential.

SYSTEMS ANALYST

Position requires 4 or more years experience in analyzing, designing and implementing large-scale business applications systems. Should have solid knowledge of quantitative methods and 1 or more years experience as a systems analyst. A degree in accounting, economics or finance is essential.

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The director is responsible for managing a centralized operation which is to provide major systems development and computing support for instructional, research, and administrative users. It is expected that strong leadership be provided for all computing applications of the University environment.

Previous experience, familiarity with computing needs in an academic setting, management skills, and educational background are the criteria to be utilized in selecting the director. The salary is competitive and commensurate with the qualifications presented. Murray State University is an Equal Opportunity/Affirmative Action Employer. The position is available immediately.

Complete application materials should be received by April 1, 1980. Send a letter of application, resume, and the names of three professional references to:

Dr. David L. Eldredge, Chairman
Search Committee for Director of CIS
c/o Office of the Vice President for
Administrative Services
Murray State University
Murray, KY 42071

SYSTEMS PROGRAMMER/ PROGRAMMER ANALYST

Ferris State College has an immediate opening for this position. The responsibilities will include both software support, to supplement current support, and applications development. This opening is in our Administrative Computing Department and requires extensive knowledge in systems generations, COBOL, ASSEMBLER and Data Base. Our equipment is a 1½ meg IBM 370/148 running under VM. We are supporting DOS/VS and OS/VS1 with on-line applications. Send resume and references to:

Gerden G. Lewis
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Search Committee for Coordinating Systems Analyst
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Position Responsibilities: Plan, supervise and participate in the development of the University's Academic Computing, including the instruction and research functions and organization. Responsibilities include coordination and supervision of support services, and user consulting and liaison. Additional responsibilities may include ongoing planning and budgeting for the academic computing functions, developing, enhancing and monitoring academic software, and reviewing and evaluating academic computing proposals for hardware and software.

Applicant Qualifications: Earned Doctorate and three years of broad experience in the delivery of academic computing services in a complex university, using large IBM compatible and interactive timesharing hardware. Technical expertise in the use of such hardware and related software with teaching, research and management experience and a proven ability to work with faculty, students and administration is a must. Academic appointment is available for qualified applicants.

West Virginia University: WVU is a comprehensive land grant university of approximately 22,000 students offering an extensive range of academic programs and graduate degrees and includes a large medical complex. The University is a major research institution and expects the research to increase during the next few years with emphasis on coal and energy research. The Academic Computing unit serves the instructional and research functions of the WVU academic community.

Respond: Please send resume, references and salary history and requirements to: Dr. John Andes, Chairperson of the Search Committee, 806 Allen Hall, Morgantown, WV 26506. Candidates will be expected to submit brief statements of their philosophy on the various facets of academic computing and the role of the Coordinator of Academic Computing in a comprehensive land grant university. Closing date is March 15, 1980. Position to be filled on or before July 1, 1980.

WVU is an affirmative action, equal opportunity employer.

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REECo

DATA PROCESSING MANAGER FOR SYSTEM 34 INSTALLATION

3-Person Dept. — Involves specialty machine shop and product marketing. Requires (2) yrs. minimum experience in RPG II Programming & OCL. Must be experienced data entry operator. Working knowledge of System 34. Knowledge of MMAS packages helpful. Position requires person adept at operating & programming besides managing. Located in Northern Michigan's Upper Peninsula. Good skiing & winter sports area — excellent hunting & fishing also.

Please send resume and state salary requirements to:

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Salary will be commensurate with experience.

This competition will remain open until a suitable candidate is selected. Please apply in confidence quoting competition #ARC — 79 to:

Senior Personnel Officer
Alberta Research Council
9th Floor, 9925 — 109 Street
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Alberta RESEARCH COUNCIL

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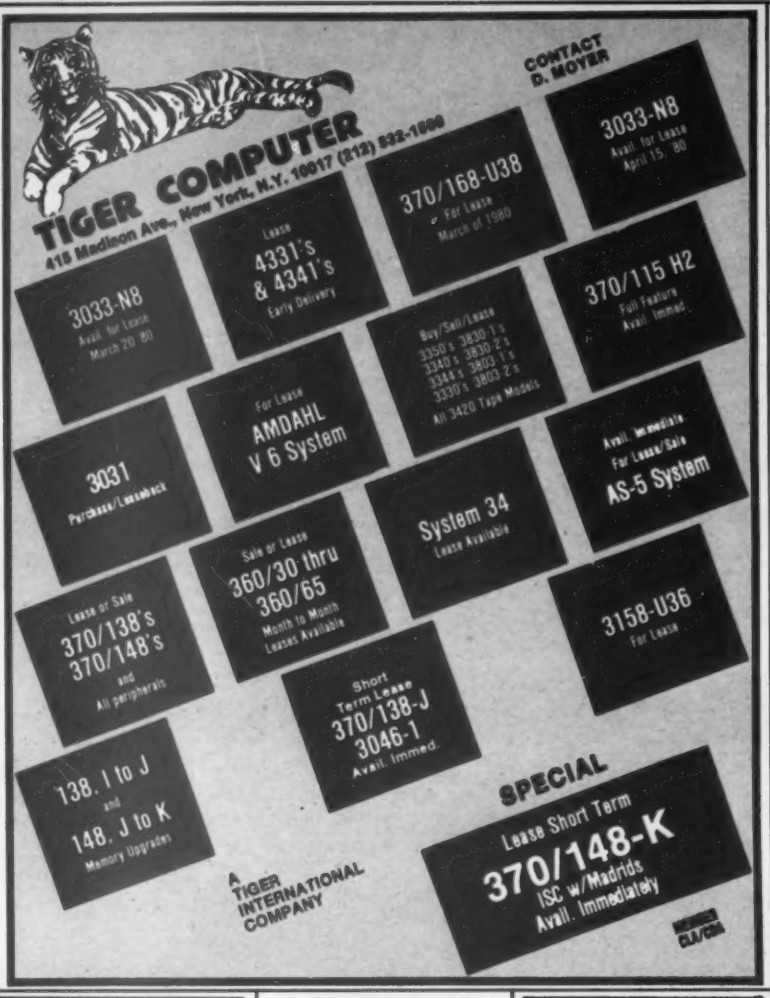
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The equipment is currently on Sperry Univac Maintenance and will be available for removal by the purchaser possibly as early as June 2, 1980, but no later than August 30, 1980. Detail specifications are available in the bid document.

All bidders must comply with the provisions of the bid conditions on Equal Employment Opportunity and Affirmative Action. To be considered a responsive bidder and be eligible for an award, all bidders must certify in writing that they will comply with the plan for Equal Opportunity and Affirmative Action developed by the authority pursuant to PL 1979, Chapter 127 and agree to adopt same prior to execution of any contract.

Bid documents will be made available to prospective purchasers who deliver or mail a letter declaring their intention to bid accompanied by a non-refundable $5.00 fee to cover reproduction and handling costs, to the Computer Services office, Room 612, Cullimore Hall, 323 High Street, between the hours of 10:00 a.m. to 12:00 noon, on normal working days on or before February 28, 1980. Bids may be rejected if not submitted within the time, date and at the place designated, and, if required, must be accompanied by a certified check or bid bond. Any and all bids may be rejected and an award made in whole or part. Direct questions in writing to the Office of Executive Director of Computer Services at the address below:

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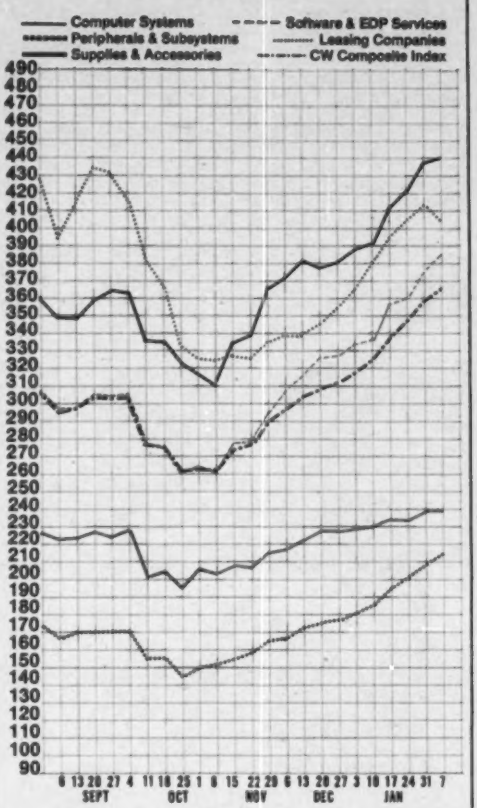

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TRADE*QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, FEBRUARY 6, 1980

All statistics compiled, computed and formatted by TRADE QUOTES, INC. Cambridge, Mass. 02139

COMPUTER SYSTEMS

E X C H		1979-80 HANGE (1)	CLOSE FEB 6 1980	WEEK NET CHNGE	WEEK PCT CHNGE
A	AMDAHL CORP	17- 84	30 1/4	+6 3/8	+26.7
N	BURROUGHS CORP	59- 87	78 1/4	-3 3/4	-4.5
O	COMPUTER AUTOMATION	9- 44	19 1/4	+1	+5.4
N	CONTROL DATA CORP	23- 81	68 7/8	+ 1/2	+0.8
O	CRAY RESEARCH INC	8- 57	53	-1	-1.8
N	DATA GENERAL CORP	42- 74	61 7/8	-4 1/8	-6.2
N	DATAPOINT CORP	34-113	111	0	0.0
N	DIGITAL EQUIPMENT	39- 74	73 3/4	- 3/8	-0.5
N	ELECTRONIC ASSOC.	2- 13	18 1/2	+1 3/8	+15.0
N	ELECTRONIC ENGINEER.	9- 19	16 1/2	-1 3/4	-9.5
N	FOUR-PHASE SYSTEMS	19- 47	33	- 5/8	-1.8
N	FOXBORO	28- 44	41 3/8	+ 1/2	+1.2
O	GENERAL AUTOMATION	7- 26	18 3/8	+1 1/8	+6.5
O	GRI COMPUTER CORP	1- 3	5/8	- 1/8	-16.6
N	HEWLETT-PACKARD CO	24- 69	67 1/4	-1 3/4	-2.5
N	HONEYWELL INC	43- 92	88 1/2	-1 5/8	-1.7
N	IBM	62-321	68 3/8	-2	-2.8
N	MANAGEMENT ASSIST	9- 29	17	+ 1/2	+3.0
O	MANUFACTURING DATA S	9- 38	32 3/4	-2 1/4	-6.4
O	MINI-COMPUTER SYST	2- 8	5 1/8	+ 1/2	+10.8
O	MODULAR COMPUTER SYS	7- 18	12 1/4	- 1/2	-3.9
N	NCR	37- 81	76	- 1/2	-0.6
N	PRIME COMPUTER INC	9- 29	28	- 7/8	-3.0
N	PERKIN-ELMER	17- 46	44 3/8	-1 5/8	-3.5
N	SPERRY RAND	33- 60	58	- 3/8	-0.6
A	SYSTEMS ENG. LABS	11- 24	20 5/8	-1	-4.6
O	TANDEM COMPUTERS INC	13- 52	52	+4 3/4	+10.0
A	WANG LABS.	6- 48	39 1/8	+ 3/8	+0.9

LEASING COMPANIES

E X C H		1979-80 HANGE (1)	CLOSE FEB 6 1980	WEEK NET CHNGE	WEEK PCT CHNGE
O	BOOTHE FINANCIAL CP	13- 21	16 3/4	0	0.0
O	COMDISCO INC	3- 21	15 1/2	+ 3/4	+5.0
A	COMMERCE GROUP CORP	1- 1	1/2	0	0.0
A	COMPUTER INVSTRS GRP	1- 7	3 5/8	- 1/8	-3.3
O	CONTINENTAL INFO SYS	3- 15	3 3/4	- 5/8	-14.2
N	DATRONIC RENTAL	1- 4	2 3/8	- 1/4	-9.5
A	DCL INC	3- 6	5 1/4	0	0.0
N	DPF INC	7- 14	7 1/8	- 1/8	-1.7
A	ITEL	4- 36	4 3/4	0	0.0
N	LEASCO CORP	24- 63	48 1/2	-1 1/2	-2.4
O	LEASPAC CORP	1- 4	1/8	0	0.0
A	PIONEER TEA CORP	2- 7	3 5/8	- 1/8	-3.3
N	U.S. LEASING	12- 20	16 1/4	+ 3/8	+2.3

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
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SOFTWARE & EDP SERVICES

E X C H		1979-80 HANGE (1)	CLOSE FEB 6 1980	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 2	1	0	0.0
O	ANACOMP INC	8- 24	20 1/4	+2 3/4	+15.7
O	ANALYSTS INTL CORP	3- 6	5 3/4	+ 1/4	+4.5
A	APPLIED DATA RES.	8- 17	12	+1	+9.0
N	AUTOMATIC DATA PROC	24- 40	38 7/8	- 7/8	-2.2
O	COMPU-SERV NETWORK	9- 19	18 3/4	+ 3/4	+4.1
O	COMPUTER HORIZONS	1- 9	4 1/2	- 1/4	-5.2
O	COMPUTER NETWORK	5- 16	8	- 1/2	-5.8
N	COMPUTER SCIENCES	8- 24	23 3/8	+ 1/2	+2.0
O	COMPUTER TASK GRMUP	1- 7	8	+ 3/4	+10.3
O	COMPUTER USAGE	2- 5	4 1/2	+ 5/8	+16.1
O	COMPUT AUTO REP SYC	4- 10	6 7/8	- 3/8	-5.1
O	CONSHARE	8- 26	17 1/2	+1 1/4	+7.6
O	CULLINANE CORP	14- 33	30	0	0.0
O	DATA DIMENSIONS INC	1- 9	1 7/8	+ 1/4	+15.3
O	DATATAB	1- 4	1 1/8	- 1/8	-10.0
O	DSI CORP	4- 9	8 1/4	0	0.0
N	ELECTRONIC DATA SYS.	19- 28	24 7/8	+ 1/2	+2.0
O	INSYTE CORP	1- 3	1 5/8	0	0.0
O	IPS COMPUTER MARKET.	2- 3	3 1/4	0	0.0
O	KEANE ASSOCIATES	4- 8	7 3/4	0	0.0
O	KEYDATA CORP	1- 5	4 7/8	+ 5/8	+14.7
A	LOGICON	18- 22	22	- 1/4	-1.1
O	NATIONAL DATA CORP	7- 19	17 3/4	- 3/8	-2.0
N	PLANNING RESEARCH	4- 10	7 3/4	0	0.0
O	PROGRAMMED TAX SYSTS	4- 5	5	0	0.0
O	PROGRAMMING & SYS	1- 1	7/8	0	0.0
O	RAPIDATA INC	4- 7	5 5/8	+ 3/8	+7.1
O	REYNOLDS & REYNOLD	18- 36	27 1/2	+2	+7.8
O	SCIENTIFIC COMPUTERS	4- 16	14 1/4	+ 1/4	+1.5
N	TYMSHARE INC	18- 54	52 3/8	+1 1/2	+2.9
A	URS SYSTEMS	9- 11	10 1/4	- 1/4	-2.3
N	WYLY CORP	1- 9	8 1/8	+ 7/8	+12.0

PERIPHERALS & SUBSYSTEMS

E X C H		1979-80 HANGE (1)	CLOSE FEB 6 1980	WEEK NET CHNGE	WEEK PCT CHNGE
N	AM INTERNATIONAL	13- 32	18 3/8	+ 3/4	+4.2
N	AMPEX CORP	18- 22	19 7/8	0	0.0
O	ANDERSON JACOBSON	5- 16	14 3/8	- 5/8	-4.1
N	APPLIED DIG DATA SYS	6- 22	8 3/4	+ 1/4	+2.7
O	AUTO-TROL TECHNOLOGY	14- 38	36	+ 3/4	+2.1
O	MEMOIVE INT'L	3- 7	5 3/8	+ 3/4	+16.2
A	MOLT-BERANEK & NEW	6- 20	20	+ 1/4	+1.2
N	HUNKER-HAMO	10- 32	29 3/8	-1 3/4	-5.6
O	CAMBRIDGE MEMORIES	1- 9	9	+ 3/4	+33.3
O	COMPUTER DEVICES INC	5- 9	8 3/4	- 1/4	-2.7
N	CENTRONICS DATA COMP	16- 54	39 1/4	+ 7/8	-2.1
O	COGNITRONICS	1- 4	3 1/8	+ 1/4	+8.6
O	COMPUTER COMMUN.	6- 18	5 5/8	- 1/4	-4.2
O	COMPUTER CONSOLES	4- 23	22 3/4	- 1/4	+1.1
A	COMPUTER EQUIPMENT	3- 7	4 1/2	- 1/4	-3.7
B	COMPUTER TRANSCEIVER	1- 5	3 3/8	+ 7/8	+35.0
O	COMPUTERVISION CORP	5- 58	52	+3 1/2	-6.3
N	CONRAC CORP	13- 26	21 7/8	+ 1/2	+2.3
A	DATA ACCESS SYSTEMS	0- 11	9 3/4	- 3/8	-3.7
A	DATA PRODUCTS CORP	13- 25	22 1/2	- 1/8	-0.5
O	DATUM INC	2- 6	3	- 3/8	-11.1
O	DECISION DATA COMPUT	2- 6	3	0	0.0
O	DELTA DATA SYSTEMS	1- 2	2 3/8	+ 1/4	+11.7
N	DOCUMATION INC	6- 34	13 7/8	-1 5/8	-10.4
O	DATARAM CORP	6- 36	35 3/4	0	0.0
N	ELECTRONIC M & N	3- 9	5 7/8	+ 1/2	+9.3
O	EVANS & SUTHERLAND	20- 47	44 1/2	+ 1/2	+1.0
O	FABRI-TEK	1- 2	1 3/8	+ 1/8	+10.0
O	GENERAL COMPUTER SYS	1- 3	2 1/8	+ 1/8	+6.2
O	GENERAL DATACOMM IND	9- 24	15 1/2	-8	-34.0
N	HAZELTINE CORP	16- 29	25 3/4	-2 1/8	-7.6
N	HARRIS CORP	17- 39	36 1/2	-1 1/4	-3.3
O	INFOREX INC	1- 11	2	- 1/4	-11.1
O	INFORMATION INTL INC	7- 14	13 3/4	+ 1/2	+3.7
O	INFOTON	1- 4	3 3/8	0	0.0
O	INTEL CORP	26- 72	69	+ 1/2	+0.7
O	INTERSIL	7- 32	29	+3 1/4	+12.6
A	LUNDY ELECTRONICS	4- 11	10 1/8	- 5/8	-5.8
O	MSI DATA CORP	6- 19	9 3/8	- 1/2	-5.0
N	MEMOREX	17- 50	14	- 3/4	-4.8
N	MOHAWK DATA SCI	0- 19	10 7/8	+2 1/8	+12.6
O	OMEX	2- 8	9	0	0.0
O	PARADYNE CORP	9- 31	20 1/4	- 1/2	-1.6
A	PENRIL CORP	9- 15	13 3/4	+ 1/4	+1.8
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	RAMTEK CORP	7- 15	16 1/4	+1 5/8	+11.1
O	RECOGNITION EQUIP	9- 13	10 3/8	+3	+40.9
O	SCAN DATA	1- 5	2 3/4	+ 1/8	+4.7
N	STORAGE TECHNOLOGY	14- 46	15 1/2	+ 3/4	+5.0
O	SYKES DATATRONICS	4- 29	26	-1 1/4	-4.2
O	T RAM INC	11- 26	25 1/4	+1 1/2	+6.3
A	TEC INC	6- 13	6 1/8	0	0.0
N	TEKTRONIX INC	33- 64	60 1/2	+ 1/4	+0.4
N	TELEX	3- 9	5 1/8	+ 5/8	+13.8
O	TESDATA SYSTEMS CP	8- 26	14 1/4	+1	+7.5
O	TIMEPLEX INC	4- 16	14	- 1/8	-0.8
O	WILTEK INC	1- 2	3/8	9	0.0

SUPPLIES & ACCESSORIES

E X C H		1979-80 HANGE (1)	CLOSE FEB 6 1980	WEEK NET CHNGE	WEEK PCT CHNGE
A	AMERICAN BUS FORMS	0- 12	10 3/4	- 1/2	-4.4
O	BALTIMORE BUS FORMS	1- 4	1	0	0.0
N	HARRY WRIGHT	14- 34	26 1/8	+1 7/8	+7.7
O	CYHERMATICS INC	1- 1	1	0	0.0
O	DUPLEX PRODUCTS INC	13- 31	26 1/8	- 1/4	-0.9
N	ENNIS BUS. FORMS	9- 21	16 3/4	- 5/8	-3.5
N	3M COMPANY	43- 66	58 1/4	+ 5/8	+1.2
O	MOORE CORP LTD	20- 34	31 3/4	- 3/4	-2.3
N	NASHUA CORP	18- 37	31 1/2	+ 1/4	+0.7
O	STANDARD REGISTER	28- 29	28	0	0.0
A	TAB PRODUCTS CO	0- 22	22	+1	+4.7
A	WABASH MAGNETICS	18- 22	14 1/8	- 1/2	-3.4
N	WALLACE BUS FORMS	18- 33	30 1/8	- 1/8	-0.4

On October 15, Amoco Container saw our ad.

Today, they're in it.

The people at Amoco Container Company* are celebrating more than a new year. They're celebrating two brand new software systems and the short three months it took to install them.

It all started when they saw MSA's October ad and took us up on our offer to help. With the assistance of MSA and MSA's training aids, including audiocassettes, workbooks, and on-site training classes for data processing and user department personnel, Amoco actually implemented two of MSA's major Big 8™ systems in less than 90 days from the time they decided to do it.

So, while we're happy to have helped the dynamic people at Amoco, we'd be even happier to do it again. For anyone. Anytime. Anyplace. We can help you.

*Amoco Container Company, a subsidiary of Amoco Chemicals Corporation, is one of the largest manufacturers of blow molded polyester containers.

MSA

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- ☐ Accounts Receivable
- ☐ Financial Forecasting & Modeling
- ☐ Fixed Assets/Property Control
- ☐ Personnel Management & Reporting
- ☐ Accounts Payable
- ☐ Supplies Inventory Control & Purchasing
- ☐ Procurement Matching

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Name	Time
Company	
Address	City
State	Zip
Telephone	Computer Model